INDIGESTION

THE DIAGNOSIS AND TREATMENT OF THE FUNCTIONAL DERANGEMENTS OF THE STOMACH

WITH AN APPENDIX

ON THE PREPARATION OF FOOD BY COOKING WITH ESPECIAL REFERENCE TO ITS USE IN THE TREATMENT OF AFFECTIONS OF THE STOMACH

GEORGE HERSCHELL, M.D. LOND.

FELLOW OF THE ROYAL MEDICO-CHIRURGICAL SOCIETY, SENIOR PHYSICIAN TO THE QUEEN'S JUBILEE HOSPITAL, LATE SENIOR PHYSICIAN TO THE NATIONAL HOSPITAL FOR DISEASES OF THE HEART, AND PHYSICIAN TO THE WEST END HOSPITAL FOR DISEASES OF THE NERVOUS SYSTEM

LONDON
HENRY J GLAISHER
57, WIGMORE STREET, CAVENDISH SQUARE,
CHICAGO: W T KEENER & CO., 90, WABASH AVENUE
1905

PREFACE TO THE THIRD EDITION

In revising this edition for the press, it has been found necessary to practically rewrite the whole book, owing to the advances which have been made in this field of medical work during the considerable time that it has been out of print.

In its present form it is hoped that it may better serve the purposes for which it was originally intended, and that it may prove useful both as a guide to the young medical man in the management of that large part of his daily work which consists of the functional derangements of digestion, and as an introduction to the larger monographs, should he have the time or inclination for the further special study of the subject.

An attempt has also been made to further increase the usefulness of the book by the introduction of a section dealing with the cookery of the food prescribed for the dyspeptic, a subject of importance both to physician and patient.

GEORGE HERSCHELL

36, Harley Street

INDIGESTION

CHAPTER I

THE PROCESS OF NORMAL DIGESTION

THE various activities of animals could not be carried out without a certain expenditure of energy, which is set free as the result of the chemical breaking down of the living substance of the body. This involves waste, requiring to be made good in order that the equilibrium of the organism may be maintained. This repair is accomplished by food, which by means of digestive processes is brought into such a condition that it may serve as building material with which repairs can be carried out, or which can be used by young animals for purposes of growth. In other words, the animal takes food to supply material to the cells of which the body is built up, such to be used as a source of energy, to replace that which has been used up by the work of the organism, or for the purpose of constructing new tissues in growing parts.

In order that we may understand the several deviations from normal which in the human being give rise to the conditions which we class for convenience under the heading "indigestion", we must first of all have a clear idea of the changes which the food undergoes during its passage along the alimentary canal, and be conversant with the processes

by which it is converted into fluid substances capable of absorption. To this end it is not necessary that I should give a complete and exhaustive account of the physiology of digestion, as this can be found in the many admirable physiological treatises in common use It will be sufficient for our purpose if a brief sketch be given of what actually happens to the food in its passage through the digestive apparatus, with special reference to the latest additions to our knowledge resulting from the work of Pawlow and other able investigators.

We can very materially aid ourselves to understand the processes of digestion as it takes place in man if we first of all study it in its least complex form in the lower forms of life. It is characteristic of a typical animal as compared with a typical plant that its food should partly consist of solid substances, which have to be taken into the body and there either converted into a solution, or else into a state of very fine subdivision. In other words, the food of an animal requires to be digested A review of the organs and processes of digestion throughout the animal kingdom shows that, in passing from lower to higher forms, there is increasing specialization, in accordance with the principle of "division of physiological labour", operating on lines comparable to those which make so many of our manufactures such highly complex industries.

Starting with the minute or microscopic animalcules (Protozoa) which swarm in both salt and fresh water, the simplest case is presented by the Proteus Animalcule (Amœba). This may be described as a shapeless particle of semifluid living matter (protoplasm), which is constantly flowing about in search of food that mostly consists of very minute plants. These can be taken in at any part of the soft body, within which they are acted on chemically (possibly by a special digestive fluid or secretion), with the result that they are in large part dissolved, and thus con-

verted into suitable material for repair and growth. The undigested or indigestible remnants of the food are cast out from any part of the creature's body, and digestion in fact goes on without any mouth or specialized digestive organs. This case is of very great interest medically, for the human body contains innumerable microscopic particles (colourless blood corpuscles) which closely resemble Amœba in structure, and are able to feed on disease germs which may enter the body from the exterior. The similarity is indeed very great. The disease germs being of a vegetable nature, being received into the body of the corpuscle, digested, and the indigestible parts again cast forth.

A little higher in the scale we find animals which have the power of inverting any portion of the body which happens to be in contact with the food substance and forming a temporary stomach around it. At this stage of evolution the whole surface of the body appears to be able to secrete a digestive fluid. In animalculæ higher in the scale the body is covered by an elastic membrane which prevents solid food from being taken in at, or waste ejected from, any part of the body indiscriminately. Hence the presence of two small areas in the body devoid of this membrane, one of which serves as a mouth and the other as an orifice from which waste can be cast out. But in this case there is no permanent digestive cavity, the food being received into the general substance of the body.

As we go higher in the scale and find organisms built up of a multitude of cells, we perceive that certain of these which form a portion of the surface of the body are set apart or, so to speak, told off to perform the digestive function, and for convenience this area is tucked in to form a permanent pouch into which the food is received. In the lower forms the undigested residue is ejected through the orifice or mouth by which it was taken into the body. In the higher forms the inverted portion of the body forms a tube running

right through the animal, and terminates in another orifice which serves as an anus An example of the first group we find in the flower-like fixed forms of which corals and sea-anemones are examples, and in the floating or swimming jelly-fishes Here we find a well-marked mouth for the reception of food, which passes through it into a large digestive cavity or stomach, where it is subjected to the chemical action of a digestive fluid. Undigested remnants are ejected through the mouth

Of the higher forms we have examples in the ringed worms or annelids, of which the earthworm and leech are familiar instances These present a marked advance upon the arrangements so far described, insomuch as they possess a complete digestive tube passing right through the body A further advance is that the digestive fluid is not now secreted by the cells composing the alimentary tube itself but that a further division of labour takes place and certain cells are aggregated into masses or groups with the sole function of providing the digestive fluid and are embedded in the wall of the tube. We thus have the secreting gland in its most primitive form. There is also a well-defined circulatory system into which the digested food is absorbed, and by which it is carried to all parts of the body.

The next higher stage in the animal kingdom is that exemplified by molluscs, such as oysters and cockles. In these the digestive tube is no longer straight, but is thrown into coils, with the two-fold object of retarding the passage of food and thus allowing a longer time for the process of digestion, and of providing a larger surface for the absorption of digested matters. We also find that the digestive tube is definitely divided into regions, which undertake special kinds of work. These are mouth-cavity, gullet, stomach, and intestine. In these animals the stomach is of chief importance, and into it is poured the juice secreted by large brown glands and capable of acting chemically upon

starch, albuminoids, and fat, the three chief classes of food-stuffs. The intestines are mainly absorptive.

When we come to the insects we find a further advance, for in addition to a digestive apparatus constructed substantially as in the molluscs, we find salivary glands which open into the mouth-cavity, and secreting a digestive fluid which acts upon insoluble starch, converting it into a soluble sugar which can be readily absorbed into the blood.

The highest stage in complexity is reached by some of the vertebrata, a group to which we ourselves belong. Fishes, frogs, reptiles, birds, and mammals present many adaptations and specializations having reference to the nature of the food, but all agree in elaborating three chief kinds of digestive fluid, which share the work of chemical digestion :—(1) Gastric juice prepared in minute tubes (gastric or peptic glands) embedded in the walls of the stomach and acting upon albuminoids; (2) pancreatic juice, elaborated in the pancreas and poured into the beginning of the intestine, where it acts upon starch, albuminoids, and fats; and (3) bile, which promotes digestion in many ways, as we shall presently see, and acts upon fats to some extent. Mammals in particular also elaborate a fourth digestive juice, saliva, which is poured into the mouth by the glands which secrete it and converts starch into sugar.[1]

Thus we learn that the digestive apparatus is in reality an involuted portion of the covering membrane of the animal, specially modified to secrete a digestive fluid. It therefore follows that the food in the digestive apparatus is really to all intents and purposes outside the body.

In the human body the changes in the food which we term digestion are brought about by—

(*a*) Mechanical disintegration in the mouth, stomach,

[1] Those interested in the subject will find an admirable résumé of food and digestion in animals in *The Natural History of Animals*, by Professor Ainsworth Davis (Gresham Press)

and intestines; (*b*) the action upon it of acid and alkaline fluids; (*c*) the changes produced by active substances termed ferments; (*d*) decomposition produced by the growth of micro-organisms.

Digestion is thus a process in which first of all by mechanical action the food is brought into such a condition as to expose the largest surface to the digestive fluids, and secondly of a process of solution mainly due to the action of specific ferments.

The digestive canal has been appositely compared by Pawlow to a factory where raw materials,—in this case the food-stuffs upon which we live,—are subjected to certain processes, mostly of a chemical nature. The result of these processes is to turn out finished products of such a nature as to be capable of being taken up by the blood and utilized in the nutrition of the individual. The resemblance to a factory really grows greater the more the subject is studied. In such a factory we should expect to find the raw material first of all subjected to a process of subdivision in one department, then passed on into a second where it would be macerated and subjected to the action of chemicals and solvents, and in like manner passed on from department to department until finally the finished product was evolved. So in the human factory, the raw material, in this case the food, is received into the first department, the mouth, where it is subdivided, passed into the second department, the stomach, where it is subjected to the action of solvents, passed into the intestines where the process is continued, until finally the finished product is absorbed into the blood current whilst the waste and useless débris is ejected from the body.

Digestion in the mouth.

The first portion of the digestive apparatus entered by the food is the mouth, in which by the act of mastication it is

more or less finely divided and is mixed with saliva. The saliva is a mixture of the secretions of the salivary glands and of the mucous glands of the mouth, and has several important functions to perform. In the first place, its office is to protect the mucous membrane of the mouth, by immediately diluting and washing away any irritating and corrosive substances, and to keep the mouth clean from all food particles which would, if allowed to remain, decompose and thus injure the teeth by the action upon them of the acids produced. Its second duty is to assist the act of swallowing by moistening food which is dry, dissolving that which is soluble, and coating with slippery mucus any portions of food which are hard and bulky. The third and perhaps the most important rôle played by the saliva is the digestion of starch. This is accomplished by a strong and energetic ferment called ptyalin or salivary diastase, which is able to act upon all starchy substances, not even excepting glycogen, and is able to convert them into amydulin or soluble starch, then into the dextrins, and finally into maltose and grape sugar. The secretion of saliva is a reflex act, the stimulus being received by the nerve endings in the mucous membrane of the mouth, and the whole of the nervous mechanism so beautifully correlated that the quantity and quality of the saliva secreted is exactly suited to the work which it has to perform. The specific stimuli which calls forth the secretion of saliva appears to be the presence of the food and the act of mastication. Moist substances such as sopped bread or sago pudding do not excite the secretion to anything like the same extent as dry food such as toast, which requires considerable mastication. It is probable that one of the chief uses of the salivary ferment is to liquefy the starch jelly into which we have converted our farinaceous food by the process of cooking. It is evident that this must be of considerable importance, as we can hardly imagine any substance much more difficult

for the gastric juice to permeate than the pasty mass in which starch is met with in our modern puddings.

It is a noteworthy fact that in the herbivora the saliva contains very little ptyalin, and in some animals, for instance the horse, is entirely devoid of diastatic power. The probable explanation of this otherwise inexplicable circumstance is to be found in the proverbial economy of Nature, who does not provide functions which are never exercised. As ptyalin can only act with advantage upon cooked starch, and as animals, at least in the wild state, can only procure raw grain, any diastatic power in the saliva must of necessity be superfluous. Reasoning from analogy, it is an interesting speculation as to whether the diastatic ferment was present or not in the saliva of the earlier races of men who lived upon this earth before the discovery of fire, and who consequently ate their food in an uncooked condition. If such were the case, the glands in process of time learnt to secrete it as opportunity was offered for its use.

The total effect of mastication in the mouth is that the food is broken up, more or less comminuted and reduced to a pulp, and the change of the starch into sugar has commenced and has even made a certain progress in the short time which elapses before the stomach is reached. In this condition the food is swallowed and passed into the next department of the digestive factory,—the stomach.

Digestion in the stomach.

It was until recently considered, and so stated in the text-books, that the conversion of starch was immediately arrested in the stomach as soon as any considerable amount of hydrochloric acid in the free state made its appearance. This idea must be placed among the number of exploded fallacies, as the investigations of Cannon and Day[1] have shown us that

peristalsis is much more active at the pyloric end of the stomach than in the fundus. It is likewise at the pyloric end that the secretion of hydrochloric acid mainly occurs. It is in consequence quite possible for food to remain comparatively undisturbed for at least two hours at the cardiac end of the stomach, the action of the ptyalin continuing without let or hindrance. Moreover, after a meal of average size all the hydrochloric acid which is formed during the first half-hour or so will enter into combination with the proteids of the food, and it is only after these are all satisfied that free acid can appear in the stomach contents. It is thus obvious that there is quite a long period of grace during which the digestion of starch can take place, and to such an extent is this normally carried after a mixed meal of average size, that at the expiration of one hour a solution of iodine (Lugol's solution) should give no change of colour with the filtrate from the contents of the stomach. If either the purple reaction of erythrodextrin or the blue colouration of starch appear, we may be sure that the digestion of starch is defective.

The stomach may be described as a large hollow compound gland, the walls of which contain muscular fibres in addition to the tubules which elaborate the special secretion. Its cavity is lined with a thick mucous membrane packed with tubular glands, and into it is being continually poured out a highly complex secretion which is called gastric juice. The purpose of this secretion is to act further upon the food, the process being assisted by continual churning movements of the stomach designed to secure an intimate mixture of the food with the gastric juice. The present state of our knowledge as to the secretion of gastric juice may be briefly summed up as follows.

The first flow of gastric juice is set up by the taste, sight, or smell of food by a reflex mechanism similar to that which controls the secretion of saliva, and is technically known as

"exciting" gastric juice because it is capable of causing a further secretion in conjunction with foods which would not otherwise have that effect. The only articles of food which will produce a flow of gastric juice when introduced by themselves into the stomach are meat extractives and water. Other articles of food were found, when introduced directly into the stomach in such a manner that no exciting gastric juice was formed (*i.e.* through a tube, or fistula), to set up no further secretion for a long time. If the extractives of meat are introduced at the same time as any of these non-exciting foods a flow of gastric juice will occur. Oil or fat when introduced into the stomach checks the secretion of gastric juice, but this inhibition can be overcome by a continued excitation of the nerves of taste.

The gastric juice contains three principal active agents, viz. hydrochloric acid, pepsin the proteolytic ferment, and rennin the milk-curdling ferment. In addition to these it has been recently shown to contain a small quantity of a substance able to emulsify fats. The ferments are secreted as inert substances called proenzymes, and are converted into functionally active ferments by the agency of the hydrochloric acid of the gastric juice. As in the case of the saliva, the mechanism for producing the gastric juice is so beautifully adjusted, that a fluid is poured out exactly suited to digest the exact quantity of food of the particular kind which has been taken. First of all there is an exact relationship between the amount of food taken and the quantity of juice secreted. Pawlow observed that whilst 26 c.c. were secreted when 100 gm. of flesh were given to a dog, 40 c.c. were provoked by 200 gm. and 106 c.c. by 400 gm. respectively.

Again, taking a mixed diet of bread and milk, the amount of gastric juice secreted was 12 c.c. and 24 c.c. for 50 gm. and 100 gm. of food respectively. In the second place the composition of the gastric secretion is precisely

adapted to digest the particular kind of food which has been eaten, articles of food more difficult of digestion being furnished with a gastric juice of a more active nature. As an example, we may contrast flesh and bread. The proteolytic power of the gastric juice secreted when flesh only has been taken may be represented by 3.99, and that when the meal has consisted of bread by 6.64. Thus we see that a gastric juice of practically double the strength is secreted in the latter case.

The food at the end of digestion in the stomach should have undergone the following changes. The gelatin-yielding parts of the meat, viz. the connective tissue, the cartilage, the white fibrous tissue, the matrix of bone and gristle, the structureless membranes, such as the sheaths of nerves, muscles, or glands, are dissolved and peptonized. The fat globules are set free, and the muscle fibres are split up into discs by the removal of the material which covers them. The change continuing, these albuminoid materials become converted into albumose and finally into peptone. The glutin of bread and the protoplasmic contents of vegetable cells are also changed into similar substances, whilst their envelopes of cellulose remain unchanged. Cane-sugar has been changed into grape-sugar, starch has been mostly converted into grape-sugar, and a little of the fat has been split up into glycerin and fatty acid. In addition to these changes any milk which may have been taken will be curdled and its casein precipitated.

In this condition, the digested food of a pultaceous consistency (chyme) as it passes through the pylorus into the duodenum will consist of—

1. Products of complete digestion in the mouth and stomach, viz. albumoses, peptone, changed gelatin, dextrose, and lævulose.

2. Substances partially digested, that is to say, dissolved but not yet converted into their final form. In this group

we shall find starch, dissolved gelatin, albumin, and isolated, partially digested, primitive muscular bundles.

3. Matters quite unchanged by the digestive fluids with which it has, up to this point, come in contact. These will be cellulose, fat, and fatty acids, and probably some starch.

4. Fluids which have not been absorbed by the stomach. These will consist mainly of—(*a*) Beverages which have been taken with the meal; (*b*) gastric juice; (*c*) saliva which has been swallowed.

5. A certain amount of mucus will in most cases be present.

Digestion in the small intestine.

When this chyme passes into the duodenum it will encounter the pancreatic juice, the bile, and the intestinal juice, each of which will exert its specific action. Matters are so arranged that when the chyme passes the pylorus and enters the duodenum it finds the pancreatic juice ready secreted and waiting for it. This wonderful provision is due directly to the gastric juice itself, which in addition to its action on the food possesses the power of exciting the secretion of the pancreas. Reasoning from analogy, this should not come as a surprise to us, since we have seen that the presence of food in the mouth excites the secretion of gastric juice. And as Nature is consistent in all things, we may reasonably expect her to carry out the scheme to its logical conclusion, and so arrange that the presence of the food in any one compartment of the digestive factory will automatically excite the secretion of the necessary digestive fluid in the compartment into which it is about to pass. The secretion of pancreatic juice is excited by reflex impulses set up by the stimulation of the mucous membrane of the stomach and intestines by the acid chyme. So that the secretion of pancreatic juice will commence as soon as hydrochloric acid commences to appear in the stomach contents. The chief

stimulation, however, is in the intestine itself, and is caused by gushes of acid chyme through the pylorus. The amount of free acid required appears to be quite small, as little as one-half per cent. being sufficient. As in the case of the gastric juice, the composition of the pancreatic secretion varies with the food; the proteolytic ferment being increased by a diet of meat, the amylolytic by one of starch. Popielski and Wertheimer have recently pointed out that this adjustment is due to a purely local mechanism, the fact being proved by its occurring when all the nervous paths from the intestine have been divided. As a control experiment acid was introduced into the blood and found to have no effect in increasing the flow of pancreatic juice. The precise method by which hydrochloric acid excites a secretion of pancreatic juice is interesting, and appears to depend not upon reflex action, but by the formation of an actual substance in the epithelial cells formed by the passage through them of the acid. This substance when carried to the pancreas by the blood current provokes the flow of pancreatic juice. That this is the true explanation is proved by the fact that a copious secretion of pancreatic juice may be excited by triturating the mucous membrane of the duodenum with hydrochloric acid and injecting it into the blood. This substance has been termed secretin, and just as in the stomach the active ferment pepsin is produced by the action of hydrochloric acid upon an inert proenzyme, it is more than probable that in this case also an inert prosecretin is converted by hydrolysis into the active ferment.

Of the nature of secretin all we can say is that it is not a coagulable proteid or a ferment as its activity is not destroyed by boiling, but is probably of the nature of adrenalin.

Pancreatic juice as secreted contains three inactive ferments, designed to act respectively upon proteids, starch, and fat. As it enters the duodenum it excites a profuse flow of intestinal juice which contains a ferment enterokinase,

This at once acts upon the inactive ferments, converting them into active substances.

Having thus briefly discussed the pancreatic juice and the mechanism by which it is secreted, let us see what happens to the food when it is poured into the duodenum. As the acid chyme passes in gushes through the pylorus it enters the duodenum where it mixes with the bile, pancreatic and intestinal juices which it finds there. The first action upon it is that of the bile, which arrests the action of the pepsin; the second that of the bicarbonate of soda in the pancreatic and intestinal juices, which neutralizes its acidity. Both these processes are absolutely necessary before any digestion can take place in the duodenum, since pancreatic digestion can only take place in an alkaline medium, and is moreover apparently inhibited by the presence of pepsin in an active state. In order to prevent the swamping of the available alkali and bile in the duodenum by abnormally large quantities of hyperacid chyme, it has been most beautifully arranged that as soon as a gush of acid chyme passes through the pylorus into the duodenum, a reflex is set up which automatically closes the pylorus until it has been neutralized. When this has taken place the pylorus relaxes and allows a second dose to pass through. In the meantime the walls of the intestine are secreting the substance the special function of which is to energize the pancreatic secretion. This is the special ferment contained in the intestinal juice which has been termed enterokinase, which we have already mentioned. Just as the hydrochloric acid of the gastric juice renders pepsin functionally active, so does the enterokinase render functionally active the proteolytic, amylolytic, and fat-splitting ferments of the pancreatic juice. Without the admixture with succus entericus pancreatic juice is useless and has no digestive power. Moreover Nature in this instance also shows her wisdom and economy, and has arranged that the stimulus to the secretion of the intestinal juice shall be the

pancreatic secretion itself. The secretion of intestinal juice therefore accompanies the passage of the mixed food and pancreatic juice along the intestine and only occurs where it is needed to do work. Latterly an opportunity has providentially occurred of checking the results obtained by experiments on animals by observation upon man. A case has been reported by Glaessner,[1] in which, as the result of an operation, pure pancreatic juice was collected from the pancreatic duct of a healthy man during eight days. This was examined especially with reference to the facts already mentioned, and the results reported by Pawlaw, Schepowalnikow, and Delezenne, and was found to corroborate them in the most remarkable manner. It was found that from 500 c.c. to 800 c.c. of a clear alkaline fluid of a sp. gr. of 1007 was secreted per diem. This would not digest albumin unless intestinal juice obtained from the post-mortem room was added. The fat-splitting ferment also was found to be most active in the presence of bile and intestinal juice. The diastatic ferment reached its period of maximum activity in the third hour after food, the proteolytic and fat-splitting in the fourth. The alkalinity was found to increase *pari passu* with the amount of ferments.

In addition to the action of the intestinal juice in energizing the ferments of the pancreatic secretion it has other and important duties to perform. It has first of all, as we have seen, to do its share in neutralizing the acid chyme, as no digestion can take place until this has been effected, and when this has been accomplished, to assist in emulsifying the fats with its surplus carbonate of soda. It is also not improbable that the carbonic acid gas formed by the process of neutralization having its origin between the particles of food may mechanically separate them, and thus allow the digestive juices to gain easier and more immediate access. The chief function of the bile appears to be to arrest the

[1] *Zeit f Physiol Chem.*, January, 1904.

activity of any pepsin which may have passed into the duodenum with the chyme, as in its presence digestion in the duodenum can be carried on with difficulty if at all. It also must assist the pancreatic juice in emulsifying the fat, as if prevented from reaching the intestine by an obstruction in the duct or experimentally by a biliary fistula, a large quantity of the fat which is eaten will reappear in the stools. Bile also increases the activity of the epithelial cells, the function of which it is to absorb the fat. It moistens the coats of the intestines and assists in giving the fæces their normal amount of water, without which they cannot be readily evacuated. It thus, when present in normal amount, acts as a natural laxative and increases the peristaltic action of the intestines.

The action of digestion in the small intestine may be summed up as follows:—

1. The change of starch into sugar which was commenced in the mouth and continued in the stomach will be completed, the action here being, however, much more energetic, the conversion of the raw as well as the boiled starch taking place. About half the weight of starch will be converted into maltose, the remainder into dextrin.

2. The fats will be formed into a fine permanent emulsion, the mechanism by which this is effected being exceedingly interesting. If an ordinary neutral fat in a perfectly fresh state be shaken up with a solution of an alkali no change takes place; but if the fat contains a small quantity of a fatty acid—in other words, if it is slightly rancid—it is immediately emulsified when shaken with the alkaline solution. The first action of the pancreatic juice upon the fat is to split a little of it up into glycerin and fatty acid by means of a special ferment which it contains in small quantity. When the fat thus mixed with fatty acid comes into contact with the alkali contained in the pancreatic juice, the bile, and the intestinal secretion, it is immediately

emulsified, and thus brought into a fit condition to be taken up by the intestinal epithelium and passed on into the chyle vessels. This emulsification is probably aided by the constant peristaltic movements of the intestines.

3. Such of the proteids as have escaped digestion in the stomach are converted into peptone and some of this peptone again into leucin and tyrosin. Mucin and nuclein are also digested to a great extent.

4. Any milk which has passed through the stomach unchanged will be curdled and the curd digested.

Digestion in the large intestine.

The digestive processes properly so called are very slight in the large intestine, its function being mainly the absorption of liquids. All the food which is capable of assimilation and which has escaped being taken up in the small intestine will be absorbed with the effect of gradually inspissating the intestinal contents as they are slowly passed along by peristaltic action. Our experience of nutrient enemata teaches us that the powers of absorption of the large intestine are really very considerable. Water, milk, flesh juice, gelatin in solution, and unchanged fluid albumin are readily absorbed. The only substance which undergoes any considerable change in the large intestine is cellulose, which undergoes a species of digestion accomplished by the agency of bacteria.

The excreta or fæces will amount to about 170 gm. in twenty-four hours and will consist of—

1. Materials derived from food.—The residue of animal and vegetable substances which have undergone digestion in the alimentary canal.

(*a*) Substances incapable of digestion.

(*b*) Substances which have been imperfectly masticated.

(*c*) Substances which have been taken in too large quantity.

2. Formed materials derived from the intestinal canal, such as red blood cells, leucocytes, and epithelium.

3. Colouring matter consisting—

(*a*) Of biliary derivatives.

(*b*) Hæmatin and sulphide of iron derived from the food.

4. Products of fermentation and putrefaction such as indol and skatol.

5. Micrococci and bacteria, which form a large part of the fæces.

CHAPTER II.

THE NATURE AND CONCEPT OF INDIGESTION —SYMPTOMS AND THEIR MODE OF PRODUCTION.

"We may fairly expect that, through those admirable physiological and pathological researches which have of late begun to illumine the subject, the limits of purely functional dyspepsia will be much reduced; so that what the physician of the present day is compelled to class under the general term dyspepsia, will be recognized by the physician of the twentieth century as several distinct affections, each with its characteristic structural change,—much in the same way that the physician of the eighteenth century was obliged to regard and treat dyspnœa as an individual disease, whilst now we have learnt to separate it into different varieties, in conformity with its prominent anatomical causes, and to treat it in accordance with its source."[1]

These prophetic words were written only fifteen years ago and have already been practically fulfilled. The diagnosis of indigestion is now rarely justifiable since it is a matter of common knowledge that the group of symptoms to which we apply the term for clinical convenience is common to many different affections of the stomach, and modern methods of examination have enabled us in the great majority of cases to find out without difficulty the exact cause of the trouble.

[1] J M Da Costa, *Medical Diagnosis with Special Reference to Practical Medicine*, p. 508. Seventh edition. London, 1890.

Strictly speaking, the term indigestion should be restricted to conditions in which the actual digestion of the food is delayed, arrested, or perverted. As a matter of fact, in many cases of so-called indigestion the digestion of the food is perfectly carried out, and the distress which is experienced by the patient is directly due to some morbid irritability or hyperæsthesia of the stomach or intestines, or of the nerves in relation with them.

When the human body is in perfect health, and the food supplied to it is normal in quantity and quality, the process of digestion is effected unconsciously—we do not know that we have a stomach. But when the digestion of food is accompanied by pain or other disagreeable sensation, either in the region of the stomach or in some other organ of the body, or when any of the functions of the body are perverted or disturbed, and we can trace a connection between such disturbance and the digestive process, we may be said to suffer from indigestion. But in such a case it must be obvious that in making use of this term we are simply using a convenient word to state that the trouble is in the digestive apparatus, and are not thereby committing ourselves to any statement as to the cause or nature of the aforesaid trouble. And used in such a sense the word is legitimate enough, and we shall be perfectly justified in telling a patient that he has indigestion and that we must investigate and find out what is the matter with him.

But the unfortunate thing is that even at the present day many medical men are satisfied to make a diagnosis of indigestion and stop there. They do not further investigate the case to find out the real cause of the symptoms from which the patient is suffering, but proceed at once to prescribe for a condition, of the exact nature of which they are profoundly ignorant. Without ascertaining whether the symptoms are caused by the retention of food residues in

the stomach, or upon some abnormality in the gastric juice, or whether the actual processes of digestion being normally carried out the discomfort owes its origin to hyperæsthesia or other neurosis, they will order the combination of drugs which they have found of benefit in "indigestion". It must be apparent that the mathematical chance of such a haphazard prescription meeting the actual conditions present will be a very slight one.

In the preceding chapter we have followed the food in its passage along the alimentary canal and have seen in what manner its digestion is effected.

It will be convenient now to study in the first place the possible factors which may interfere with the process and prevent it from proceeding by normal stages unaccompanied by disagreeable sensations, and from producing normal end products. We may then with advantage discuss the manner in which symptoms may arise in connection with the indigestion of food.

The first factor in the production of indigestion may be the treatment which the food receives in the mouth itself, where it may be imperfectly masticated. In consequence an abnormal quantity of uninsalivated starch will reach the stomach, and the food, instead of being finely divided, may be in a condition difficult to digest. The subject will be further discussed in the chapter dealing with alimentary indigestion. The other cause of indigestion arising in the mouth is the presence of septic stumps or a pyorrhœa alveolaris. As the result of this condition micro-organisms will be swallowed with the food and may act injuriously in the stomach, as we shall presently see.

The food now reaches the stomach—

(*a*) From imperfect mastication it may contain an insufficient amount of saliva for the conversion of starch into sugar to be normally carried on.

(*b*) From the same cause it may be in such large pieces

that the gastric juice may find it difficult to act efficiently upon it.

(*c*) It may be mixed with bacteria from the mouth which may—

Irritate the mucous membrane of the stomach and set up chronic gastritis.

Set up fermentative processes in the stomach.

(*d*) There may be excessive mucus in the stomach as the result of chronic gastritis, which will by coating the food prevent the ready access of the gastric juice.

(*e*) The gastric juice may be normal in composition but secreted in excessive amount. Under this heading we have two distinct affections,—alimentary hypersecretion and continuous hypersecretion. In alimentary hypersecretion we find an excessive secretion of gastric juice as the result of the stimulation of normal food. This occurs only with the stimulant of secretion; that is to say, when food is present in the stomach. In continuous hypersecretion, which is a disease of a more severe nature, the gastric juice is secreted when the stomach is empty.

(*f*) The hydrochloric acid in the gastric juice may be in excess. In practice this condition is met with in two forms:—

Primary hyperchlorhydria.—This is a purely local condition, and is due to the irritation of the secreting glands of the stomach by alcohol, tobacco, condiments, or overstimulating or unmasticated food. At first of a functional nature, by long-continued irritation it becomes eventually an anatomical disease with proliferation of the secreting tubules of the gastric mucosa.

Secondary hyperchlorhydria.—The local affection in this case is a symptom of some constitutional disease, such as gout or neurasthenia.

The effect upon the digestion of food of an excess of hydrochloric acid in the stomach is mainly shown in the

conversion of the starch. As the secretion of hydrochloric acid is more rapid, it will finish entering into combination with the proteids at an earlier period and will thus curtail the time during which the conversion of starch can go on.

(*g*) The ferments and hydrochloric acid in the gastric juice may be diminished or absent. These two things practically always go together, and are met with in certain cases of defective innervation of the stomach, in chronic gastritis, and in atrophic conditions of the gastric mucous membrane. When occurring in malignant disease there is a difference of opinion as to whether they are entirely the result of the chronic gastritis which invariably accompanies or whether there is some other more occult cause. In any case the effect upon digestion will be that the food will be imperfectly acted on in the stomach. Its stay in the stomach will in consequence be prolonged, since the pylorus normally only ejects the digested food into the duodenum when it has reached a certain degree of solution.

(*h*) The peristaltic movements of the stomach may be defective, and in consequence the food not properly churned.

(*i*) The stomach may be unable to empty itself at the end of the digestive period, the consequence being that the remains of the meal will be retained, undergo fermentation, and set up irritation, giving rise to a very important train of symptoms.

Motor insufficiency of the stomach may arise from general weakness of the muscular walls of the stomach, defective innervation of the stomach walls, infiltration of the walls by a neoplasm, or by obstruction to the stomach emptying itself.

The food as it leaves the stomach and enters the duodenum may be of such a nature or be in such a condition as to ensure its indigestion in the small intestine,

even provided that the functions and secretions contained in the latter are perfectly normal. Or *per contra* a normal chyme, the product of normal digestion in the stomach, may find a condition of things in the duodenum incompatible with its further elaboration.

The abnormalities in the chyme which will certainly lead to trouble in the intestine are the following :—

(*a*) A hyperacid condition.—As we have seen, it is necessary that the acidity of the chyme should be completely neutralized before any digestion can take place in the duodenum. In cases of hyperchlorhydria, and hyperacidity due to organic acids (organacidia, Knapp), the amount of alkali immediately available in the intestine is not sufficient to completely neutralize the excess of acid. The inevitable result must be intestinal indigestion.

(*b*) A septic condition of the chyme.—In cases of dilatation of the stomach the final result of the stay of the food in the stomach is a partially digested chyme, decomposed, and teeming with micro-organisms and their acrid and irritating products. Nothing can be expected from the entrance of this into the intestine but catarrh of the intestine and a practical arrest of all digestive processes. A similar result but usually of a milder form follows the fermentations which take place in the stomach as the result of the swallowing of septic pus from pyorrhœa alveolaris. In these cases motility is often unimpaired and the stomach contents are ejected into the duodenum before any very considerable fermentation has taken place.

But even supposing the chyme be normal, it does not necessarily follow that its digestion in the intestine will proceed uninterruptedly. We may find a deficiency of bile or pancreatic secretion or of succus entericus. Of these conditions we know little for certain as yet, but we may assume—

(*a*) That if the bile is deficient, the action of the pepsin

will not be arrested and the fat will not be properly emulsified.

(*b*) That if the pancreatic juice is absent or in defect, the further digestion of the proteids and starch will be arrested or reduced.

(*c*) That if the intestinal juice be not secreted, the enterokinase which renders functionally active the different ferments of the pancreatic secretion will be wanting, with what results upon the process of digestion in the intestine we can only imagine.

I am strongly of opinion that we shall find in a defective secretion of succus entericus the explanation for the rapid downward progress of cases of sprue and other forms of gastro-enteritis which occurs when they have passed beyond a certain stage. In sprue, for example, recovery appears to be impossible when a certain amount of damage has been done to the mucous membrane of the intestine. In certain forms of atrophic gastritis with achylia gastrica, nutrition is maintained for a considerable time, the gastric digestion being replaced by duodenal digestion. Usually after a time this fails and the patient rapidly goes down hill in spite of all our efforts. As in these cases there is no reason for assuming failure of the pancreatic secretion, we must, I think, come to the conclusion that the extension of the inflammatory process to the intestine gradually circumscribes the area capable of secreting succus entericus, until that which remains cannot produce enough enterokinase to render it functionally active.

(*d*) We may also find in some cases a condition of catarrh of the intestine, which may interfere with digestion by hurrying the food along and not allowing proper time for the completion of the normal processes.

In the large intestine, as we have seen, no real digestive processes take place. We may, however, have certain symptoms associated with so-called indigestion as the direct

result of conditions obtaining in this part of the alimentary canal.

(*a*) The food may be deficient in cellulose.—Under these circumstances one of the normal stimuli to the peristaltic movements of the bowel being deficient, constipation will be the result.

(*b*) There may be a condition of chronic colitis.—The effect of this will usually be to diminish the peristaltic movements of the intestine, and cause constipation.

(*c*) The innervation of the intestine may be abnormal. From this cause we may find variously, hyperperistalsis, hypoperistalsis, or spasm.

The effect of these conditions may be thus summed up. When the peristalsis is increased we have the food hurried along the intestine, with the inevitable result that absorption of water is interfered with and the stools become loose. On the contrary, when the movements of the large bowel are defective, we shall find constipation, fæcal retention, abnormal fermentation, and accumulation of gas associated in many cases with certain nervous phenomena. These nervous symptoms, such as headache, irritability of temper, melancholy, pins and needles in the hands and feet, numbness and tingling, are familiar to all of us as results of constipation, but it is yet a disputed point as to whether they are reflex in their origin or are due to the absorption of toxines.

Such then are the conditions which may be present in the different parts of the digestive tract and interfere with the proper elaboration of the food or give rise to symptoms.

It remains to study the circumstances under which these abnormalities may occur.

We may, meanwhile, anticipate by saying that we may find the explanation of the symptoms in any given case of indigestion in one or more of the following conditions:—

A. The digestive system of the patient may be perfectly

healthy, but the food may be abnormal in bulk, or of such a nature as to be difficult or impossible of digestion.

B. The affection of the stomach may be secondary to, accompany, or depend upon, disease of some other organ of the body, or morbid constitutional state, or some local or systemic intoxication.

This very comprehensive section will include—

(*a*) Affections of the stomach caused by or accompanying affections of the nervous system such as neurasthenia and hysteria.

(*b*) The gastric derangements which occur in the course of anæmia, bronchitis, cardiac disease, fevers, gout, hepatic disease, phthisis, renal disease, and syphilis.

(*c*) The troubles set up by the inordinate use of tea, tobacco, alcohol, and opium; chronic poisoning by lead or arsenic, or the continual absorption into the system of septic pus, either from a pyorrhœa alveolaris or from an abraded cervix uteri.

C. Primary local disease of the stomach itself.

(*a*) Inflammation acute or chronic.

(*b*) Ulceration and erosions.

(*c*) Neoplasms, benign or cancerous, either infiltrating the walls of the stomach or obstructing one of its orifices.

(*d*) Atony of the muscular walls of the stomach.

(*e*) Local defect in the innervation of the stomach.

(*f*) Displacement of the stomach.

(*g*) Chronic enteritis.

And it is our duty in the case of every patient who comes to consult us for digestive trouble to ascertain—

1. The precise abnormality if any in the actual processes of digestion.

2. The cause of this abnormality, whether residing in the food itself, locally in the stomach, or generally in the systemic condition of the patient.

Then, and then only, can we truthfully say that we have made a diagnosis and have honestly investigated the troubles of our client according to the methods which modern science has placed at our disposal. • • •

We may usefully close this chapter with an analysis of some of the principal symptoms met within, and common to, the several affections of the stomach, and attempt to some extent to trace out the manner in which they occur. Any classification of symptoms will not be attempted, as the subject is far too complicated to be usefully treated in a work of the elementary nature that this is intended to be. The chief symptoms only will be enumerated and a brief description given of the circumstances under which they are most usually found.

Sensations of fulness or pressure referred to the region of the stomach.

This is a symptom which is met with in nearly every affection of the stomach, and may vary greatly in intensity. In its mildest form it may consist merely of a slight feeling of oppression which is quite endurable and gradually diminishes as digestion proceeds. In other cases it is continuous and has not disappeared when the time for the next meal comes round. As regards its causation, whilst in some cases it is a purely nervous sensation, and may accompany a perfectly normal digestion, in others it is produced by actual distension of the stomach either by a too abundant meal, or by gases evolved by fermentation of the contents of the stomach.

Sensation of dragging often amounting to actual pain.

This is often met with under the following conditions:—

(*a*) Where the stomach is dilated.—Under these circumstances the abnormally large contents of the stomach weigh-

ing considerably more than normal will really pull at the attachments of the stomach and give rise to this feeling.

(*b*) In cases of gastroptosis or downward displacement of the stomach.—When this has occurred the weight of a meal of normal size will often produce considerable discomfort, possibly as Van Valzah believes from stretching of nerve filaments in the supporting ligaments. The peculiarity of this pain is that it is absent in the morning on rising, comes on shortly after assuming the erect position, and becomes more severe as the day advances. It may also usually be set up by a muscular effort such as stretching up the arms.

(*c*) Dragging sensations or actual pain may be due to adhesions.—These may exist between the stomach and adjacent organs as the results of previous ulceration, or more commonly between the intestines or the intestines and viscera in contact with them. It is as well to bear in mind that the position of an abdominal pain does not very often correspond with that of the affected part. It is thus quite common to find the pain of intestinal adhesions referred to the stomach region. The characteristic of these pains is that they often occur in the early morning, waking the patient from sleep.

Actual pain.

This may vary in intensity, frequency, time relation to meals, and duration, according to circumstances, and may be produced in any one of the following manners :—

(*a*) It may come on entirely independently of food, and in this case is of a neuralgic nature being really situated in the epigastric plexus although referred to the stomach by the patient. Such pains are met with in neurasthenia, and paroxysmally in the crises of tabes.

(*b*) The pain may come on when the stomach is empty shortly before a meal, and may be relieved by food.—By far the commonest cause of this pain is neurasthenia, and it appears to be a local expression of general nerve exhaustion.

In fact it is the cry of the system for food. In other cases it is apparently due to hypersecretion of gastric juice. In this condition, as we have seen, the secretion of gastric juice is not confined to the time when the food is in the stomach, but occurs continuously, and given an abnormally sensitive condition of the interior of the stomach, pain will be produced. In these cases, as in ordinary hyperchlorhydria, it is relieved when food is taken, because this combines with, and, so to speak, mops up, the offending acid.

(*c*) Pain that occurs as soon as the food reaches the stomach. —This is due to the contact of the food with the interior of a stomach which is abnormally sensitive from some cause or another. Usually there is either an ulcer present, or there is nervous hyperæsthesia often of an hysterical nature.

(*d*) Pain at the height of the digestive period, that is about two or three hours after meals, the exact time depending upon the kind of food that has been consumed.—This pain is almost invariably due to an excess of hydrochloric acid in the gastric juice, although in some cases where the stomach is abnormally sensitive the normal amount of free acid will produce discomfort. In some cases of ulcer also, the pain does not come on directly the food is swallowed, but only commences to be experienced when free hydrochloric acid makes its appearance in the stomach contents. Such pain is relieved by more food or by a dose of an alkali, either of which will enter into combination with it and convert it from the free to the combined condition.

(*e*) Pain four hours or so after the meal has been taken.— Pain coming on with this time relation to meals may be due—

1. To the fact that the stomach does not empty itself into the duodenum, and in consequence abnormal fermentations have taken place with the formation of acrid organic acids which irritate the stomach wall, or the evolution of gas which distends it.

2. Or that the food having passed into the duodenum comes in contact with, and irritates an ulcer there.

Eructation of gas.

This common and distressing symptom may arise in several different ways:—

(*a*) During digestion a small amount of carbonic acid gas is generated by decomposition of carbonates contained in the food by the acid of the gastric juice. In a normal stomach which is in a state of tonic contraction upon its contents this would be at once propelled onwards into the intestine. When, however, the stomach is atonic this does not take place, and the gas will gradually accumulate until a sufficient amount has been formed to force the cardia and be brought up.

(*b*) From the fermentation of food materials in the stomach. This will take place when from muscular weakness the stomach is unable to empty itself at the proper time into the intestine, when the food is of an abnormally fermentable character, and when the germs which cause fermentation have been swallowed in excessive quantities, as happens in cases of decayed teeth and pyorrhœa of the gums. The gases evolved may consist of carbonic acid, sulphuretted hydrogen, hydrogen, and nitrogen and the hydrocarbons. The hydrogen and nitrogen are produced by the bacteria which set up the butyric and acetic acid fermentations, but the marsh gas is formed incidentally to the solution of the cellulose taken in the vegetable matters used as food. We have thus an explanation of the proverbial windiness of cabbage.

(*c*) Flatulence occurring when the stomach is empty may be due to—

1. The decomposition by the hydrochloric acid of the gastric juice of the sodium carbonate in the saliva which has been swallowed,

2. The decomposition of the sodium carbonate contained in pancreatic juice which has regurgitated into the stomach through the pylorus,
3. Air which has been swallowed either with the food or saliva, and
4. Probably to an exchange of gas between the blood circulating in the stomach wall and the contents of the stomach. Such is a possible explanation of the sudden attacks of flatulence which, accompanied by pain, often occur in neurotic individuals, and are frequently induced by some mental excitement. We must, however, not forget that such attacks of flatulence are sometimes pre-ataxic signs, and in my experience are occasionally met with before the loss of knee jerk and the lightning pains, in cases which eventually become tabetic.

Eructation of fluid

(*a*) Eructation of acid liquid.—A small quantity of acid liquid "which sets the teeth on edge" may be brought up into the mouth. In many cases the liquid does not reach the mouth, but only comes in contact with the lower end of the œsophagus. The fact that under these circumstances a sensation of heat and constriction is complained of either in the epigastrium or throat has given rise to the technical name *pyrosis* or *heart-burn.* The sensation is evidently due to irritation of the mucous membrane of the cardiac end of the stomach or lower end of the œsophagus by the irritating nature of the stomach contents. This symptom undoubtedly is due in most instances to increased amount of acid in the stomach contents, and this may be either a real increase in the amount of hydrochloric acid secreted or more often an excessive production of irritating organic acids as the result of fermentative changes. In some few cases of most distressing heart-burn which I have

seen the stomach contents upon analysis showed an absence of excess of acidity either organic or inorganic. In these patients there was in all probability some abnormality of the process of digestion which resulted in the formation of peptones of an acrid and irritating nature.

(*b*) Eructation of neutral or alkaline fluid.—This condition, which has been termed waterbrash, usually occurs in the morning on an empty stomach. It often commences with pain at the pit of the stomach increased by movement. After this has continued for some little time a thin colourless fluid is brought up, which is alkaline, usually tasteless, and varies in quantity from a teaspoonful to one or more ounces. This fluid is in many cases evidently saliva, from he fact that it gives a red reaction with ferric chloride and converts starch into sugar. As pointed out by Martin, this saliva is secreted after the food has passed into the duodenum, the direct stimulus to its production being the irritation of hyperacid chyme. According to the same authority, in cases where the fluid is not saliva it may be an exudation into the stomach as the result of mechanical congestion, or may be bile and pancreatic juice, which have regurgitated from the duodenum.

Alterations in the hunger sense

In functional affections of the stomach the appetite may range from absolute anorexia, or complete loss of appetite, through various grades up to bulimia, in which the sense of hunger is experienced in its highest degree. In many cases the appetite is perverted, and unnatural inclination exists to eat either articles of diet forbidden by the physician, or strange and abnormal substances which in a state of health would excite disgust.

Loss of appetite.—This is a frequent symptom in many diseases of the stomach, and varies much in degree. Its

cause is probably complex, and may depend upon the following factors:—

(*a*) The condition of the epithelium upon the surface of the digestive tract.—The association of a furred tongue and loss of appetite is familiar to us all.

(*b*) The condition of the nervous system.—It is a matter of common knowledge that anything, such as bad news, anxiety, or fear, which is calculated to make a profound impression upon the nervous system will often take away the appetite at once.

(*c*) The condition of the circulation through the stomach.—Beaumont observed upon his patient, Alexis St. Martin, that when his appetite was good the mucous membrane of the stomach was injected. We also know from clinical experience that in cases of hypersecretion the patient experiences a sensation of hunger although the stomach is full of food. We also know that bitters which increase the sense of hunger act as irritants to the mucous membrane of the stomach. Conversely in cases of mechanical interference with the blood-flow through the stomach, as in cardiac or hepatic disease, we usually see that the appetite is defective.

(*d*) Poisons circulating in the blood.—In cases where the blood is loaded with the products of metabolism as in lithæmia, or with urinary poisons as in uræmia, or with the toxins of malignant disease, the loss of appetite is frequently absolute, and may amount to disgust for food in any form, accompanied by a feeling of nausea at the idea of eating.

Abnormal sensation of hunger (Bulimia).—Bulimia is usually described as a pure neurosis of the stomach, but I am convinced that in the majority of cases it is due to the local irritation of food residues undergoing fermentative changes. It is thus not unfrequently met with in cases of muscular insufficiency of the stomach of the second degree

accompanied by hypersecretion. In these cases the sensation of hunger is often uncontrollable.

It may however occur as a neurosis pure and simple, of which the following case, recorded by Peyer, is a good example.—A lady, *æt.* thirty-two, after a prolonged period of worry and trouble, was suddenly attacked with a sensation of misery at the epigastrium, which rapidly developed into a feeling of hunger, so intense as to be absolutely painful. She at once drank three pints of milk, but without relief, and her symptoms increasing in intensity, she feared that she was about to die. Within an hour she had taken three pints of milk, twenty-three eggs, and two pints of wine. At last she became exhausted and fell asleep. In the morning following she was quite well, and did not have any repetition of the attack.

Chronic cases of bulimia are not uncommon and present a feeling of satisfaction directly after food; but the hunger soon returns, and if food is not again taken great distress ensues. Most of the patients affected with bulimia suffer from many other symptoms of abnormal irritability of the nervous system. In fact the condition may be taken to be an expression of excessive irritability of the centripetal nerves which regulate the sensation of hunger.

Alterations in taste are very generally present in affections of the stomach. There may be a sour or bitter taste in the mouth, or it may feel unpleasant, pasty, or foul. The explanation is probably the varying condition of the epithelium in the mouth.

Nervous Symptoms.

A very considerable number of the symptoms met with in derangements of digestion may be referred to the nervous system. In some cases these are evidently reflex, but in others they are probably due to the absorption into the system of poisonous substances which are actually gener-

ated in the stomach and intestines during the process of digestion. Some of the best work in the elucidation of the mode of action and formation of these substances was done a considerable time ago by Brieger, who pointed out that alkaloids were formed in putrefying meat quite analogous to some of those occurring in plants. From decomposing meat he isolated two poisonous substances, choline and neurine, and from putrid fish an alkaloid, which he named muscarine as it appeared to be identical in action with the muscarine found in certain fungi, and like it was antagonized by belladonna. He also discovered that under certain conditions a poisonous alkaloid was actually formed during the digestion of fibrin by pepsin. This he termed peptotoxin, and demonstrated that it had an action similar to that of curare.

In cases of indigestion accompanied by symptoms referred to the nervous system one must be always on one's guard not to confuse a causal or concomitant neurasthenia with one produced by the gastric condition. The distinction is extremely difficult in some cases of indigestion accompanied by nervous symptoms. In these cases it is obvious that we have a derangement of digestion, and also certain symptoms referred to the nervous system. The question to be answered is whether the nervous symptoms are part of a neurasthenia which is the cause of the stomach trouble, or whether the nervous symptoms have been caused by the stomach trouble, or whether both are concomitant and have no causal relationship. In many cases, as is well known, we have a vicious circle set up, neurasthenia interfering with digestion in one of the ways to be shown later on, and the abnormal products of digestion or the malnutrition resulting from the indigestion in turn perpetuating the neurasthenia. The nervous symptoms most commonly met with are the following :—

Mental Depression.—It is a well-known fact that the process of digestion when delayed or imperfectly performed is

often accompanied by a feeling of depression, which may vary from a slight uneasy sensation in the head to the most intense melancholy. There is very little doubt that these sensations are caused by the absorption into the system of the poisonous products of imperfect digestion to which allusion has already been made. This explains the often marvellous effect of a dose of blue pill in such cases. It is a matter of common observation that a smart mercurial purge will often entirely alter the aspect of things in general. After a good evacuation from the bowels, life, which before looked full of gloom, again appears worth living, and troubles which seemed unbearable now become things to be laughed at. The purge has washed away the decomposing material from the large bowel, and the morbid substances which have been absorbed are quickly eliminated through the urine.

Drowsiness.—This symptom is not unfrequently present during imperfect digestion, and usually comes on an hour or two after meals. This is the period when intestinal digestion is commencing; and as this symptom is so frequently met with in cases where the liver is functionally disturbed, it is more than probable that there is some connection between it and a derangement of some kind in the biliary secretion.

Headache.—The varieties of headache associated with functional derangement of the stomach are manifold. In gastric neurasthenia the commonest form appears to be an uneasy feeling, hardly ever amounting to actual pain, felt in the back of the head and extending a little way down the nape of the neck. In intestinal indigestion we frequently get a throbbing frontal headache, whilst in gastroptosis I have often seen a vertical headache. A typical migraine is often directly caused by irritation in the stomach, and I have at the present time under my care a patient who can bring on an attack at will by taking a dish of highly seasoned food such as a hot curry.

Giddiness and dizziness.—The first medical writer to trace a connection between giddiness and dyspepsia was probably the French physician Trousseau, who in his classical clinical lectures described it under the name of *vertigo a stomacho læso.* Whilst it is a well-known fact that vertigo does frequently occur in dyspepsia, yet I think that it is extremely probable that many of the cases narrated by Trousseau were really labyrinthine, as Menière's disease had not been recognized at the period when he wrote. And it is for this disease and also for slight epileptic attacks that we must be on our guard when we meet with a patient suffering, as we think, from giddiness due to stomach derangement. I can call to mind more than one case where a patient has treated himself for years for periodical attacks of, as he supposed, "indigestion and biliousness", and in which, on examination, almost complete deafness of one ear has been found. And this mistake is more readily fallen into from the fact that in Menière's disease a disordered stomach not unfrequently acts as the exciting cause of an attack. The vertigo arising from stomach disorder comes on suddenly, often only lasts a moment, and is not a true vertigo, but a sensation of unsteadiness and instability. The patient is usually walking in the street, and suddenly feels as if he would fall, and catches hold of the railings or his companion. Sometimes he will feel as if the pavement were heaving under his feet. As a rule I think that there is invariably either dilatation of the stomach or gastroptosis in these cases.

Formication and tingling.—This symptom is very frequently met with, and may be localized to a finger or toe, to the tongue, or may extend over a larger surface of the body. It is a fact to be noted that in many cases the area over which it is felt does not correspond to the distribution of a cutaneous nerve, but to one of Head's spinal segments.

Numbness.—All of us are familiar with the numbness in a limb caused by pressure upon a nerve, such as occurs when

we sit with our leg over the rail of a chair. In certain dyspeptic conditions this phenomenon is produced with much greater facility and as the result of much slighter pressure. Mere pressure of the arms upon the bed may cause numbness in the region supplied by the ulnar nerve, and the act of sitting on a soft padded seat may induce the same condition in the legs. In fact, in cases where this symptom is well marked I have occasionally seen a patient hardly able to find any position of the body in which he could lie without producing numbness in some skin area or other.

There are two abnormal sensations in other parts of the body which I believe are frequently met with in dyspeptic conditions—

1. A sensation of heaviness in one foot, or the feeling of constriction round the calf of the leg.—This is, I am convinced, dependent upon indigestion, as I have observed it to invariably follow a meal containing articles difficult to digest in some cases in which it occurred.

2. A sensation as if one side of the mouth were stiff and drawn up.—That this is reflex from the stomach is proved by the fact that in certain subjects it can be induced at will by the administration of irritating substances such as pepper or curry. When once it has started, it may persist for hours, days, or even weeks, and cause the greatest distress and apprehension in the patient. In some instances there is a subjective sensation as if the lips were swollen, and in others the articulation of mimetic words is interfered with. When such is the case, the patient, if a medical man, usually fancies that he is about to develop G.P.I. It is a curious fact that almost invariably the left side is affected. The cases in which I have observed the symptom were all neurasthenic and had a greater or less degree of gastric myasthenia.

Irritation in the nose, sneezing, and sensation of constriction.—The connection between these symptoms and dis-

ordered digestion is usually overlooked. I have frequently observed them in dyspeptics, and have no doubt of the relation. In one of my patients all the symptoms of coryza would make their appearance about three hours after an indigestible dinner, passing off at the time when the stomach emptied itself into the duodenum.

Many patients suffer at night with a sensation as if the nose were compressed, attended with frequent involuntary sniffing. From observations made personally upon such patients, I have satisfied myself that there is absolutely some swelling of the mucous membrane covering the turbinates, and that this is invariably associated with atonic dilatation of the stomach. It is probably a local vaso-motor disturbance resembling globus hystercus produced reflexly by irritation of the vagus nerve.

Having now a clear idea of the different circumstances under which indigestion can occur and the way in which symptoms are produced, we are in a position to appreciate the absurdity of the diagnoses which were made by the physicians of the nineteenth century. Cases of functional disease of the stomach were divided as follows: atonic dyspepsia, irritative dyspepsia, flatulent dyspepsia, acid dyspepsia and gastric catarrh. Of course each of these names designates a group consisting of two or more distinct affections possessing the symptom which gives the name to the group in a marked degree, and there can be no harm in thus classifying functional diseases of the stomach from a purely academic standpoint. But unfortunately the physician of the last century considered each of these artificial groups as a distinct type of disease, and used these terms as diagnoses. In order to make this important point quite plain it will be as well to take these groups and enumerate the different conditions which are connoted by each.

Atonic dyspepsia.—Under this heading we have logically included—

(*a*) Atony of the muscular walls of the stomach.
(*b*) Atony of the secreting tissue, resulting in hypochlorhydria and hypochylia.
(*c*) Dyspepsia arising from a general atonic condition of the body.

Each of these conditions has a different pathology and requires different treatment.

Irritative dyspepsia.—This was the name applied to cases of digestive trouble marked by symptoms of irritation such as pain, pyrosis, and cases of vomiting where there was no marked dilatation. In this group we may obviously have—

(*a*) A hyperæsthesia of the stomach as a pure neurosis.
(*b*) Hyperæsthesia due to ulcer or erosions.
(*c*) Functional hyperchlorhydria.
(*d*) Hyperchlorhydria due to sthenic gastritis.
(*e*) The chronic gastritis of alcoholism.
(*f*) The irritation of unsuitable food.
(*g*) The irritation of retained food residues.

Flatulent dyspepsia.—The chief affections under this heading will be—

(*a*) Cases of nervous belching of wind met with in hysteria and neurasthenia.
(*b*) Any condition leading to the retention of food residues in the stomach such as—
  1. Atony of the stomach wall.
  2. Pyloric stenosis.
  3. Cases of prolonged digestion from causes such as hypersecretion.
(*c*) Certain cases of constipation where there is regurgitation of gas from the intestines into the stomach.

Acid dyspepsia.—Dyspepsia marked by an increase of acid in the stomach may be due to—

1. An increased secretion of hydrochloric acid in the stomach.
  (*a*) Sthenic gastritis.
  (*b*) Primary or secondary hyperchlorhydria.

2. Abnormal fermentations in the stomach due to—
   (*a*) Motor insufficiency.
   (*b*) Prolongation of digestion.
   (*c*) Abnormalities in the food.
   (*d*) Presence of bacteria in the stomach.

Gastric catarrh.—This was a diagnosis which was often made, and usually without a shadow of an excuse. Gastric catarrh or chronic gastritis is a local inflammatory affection of the stomach possessing well-marked characteristic signs, and comparatively rare as a primary affection. The diagnosis is never justified without absolute proof that an abnormal amount of pathological mucus is secreted by the walls of the stomach, as the symptoms present are common to so many gastric conditions. Looking over the histories of fifty consecutive cases taken from my notebooks which were sent me as gastric catarrh, I find twenty cases of gastric myasthenia pure and simple, eight cases of neurasthenia complicated with myasthenia, ten cases of gastric neurasthenia, four cases of chronic gastritis complicating neurasthenia, two cases of hypersecretion, and six cases only in which the diagnosis of gastric catarrh was correct.

Having now a general idea of the process of digestion and the chief departures from normal, we are in a position to study the clinical forms in which indigestion is most frequently met with in actual practice.

CHAPTER III.

INDIGESTION DUE TO IMPROPER FOOD.

ABNORMALITIES IN THE FOOD WHICH INTERFERE WITH DIGESTION.—ACUTE INDIGESTION.—CHRONIC INDIGESTION.—HYPERCHLORHYDRIA.—HYPERSECRETION —CHRONIC MUCOUS CATARRH.—MYASTHENIA.

IN this chapter will be discussed the disorders of digestion which result from imposing an excessive amount of work upon a normal digestive apparatus. Although as I have stated the term indigestion is a convenient one to use as a means of simply expressing in a concise manner the fact that there is some trouble associated with the digestion of food, we are logically compelled to restrict its use as an ultimate diagnosis to cases where no functional or organic disease can be demonstrated. The imperfect indigestion is then due to the inability of a normal stomach to deal with food abnormal in quality or quantity. For instance, if the stomach should be abnormally weak, as it often is in cases of general neurasthenia, then the indigestion will be merely a concomitant, and the diagnosis must be gastric neurasthenia. Likewise, whenever the stomach ceases to be normal—for instance, when abnormal food has set up catarrh —then our diagnosis must be catarrh, not indigestion, although the latter would have been admissible in the first stage before the catarrh was set up. The subject has moreover a far wider range of interest, since in any particular disease of the stomach we may get additional symptoms set

up by food unsuited to the condition of the patient. In other words, to the indigestion resulting from the primary disease we may have superadded another indigestion due to improper food. And in this case the abnormality of the food may be merely relative, that is to say, that which would be normal food for a normal stomach may impose a disproportionate amount of work upon an organ weakened by disease. It will therefore amply repay us to study the different conditions under which food may produce difficulty of digestion. The chief of these are the following :—

Imperfect mastication.

This may be due to undue haste in eating. Contrary to the generally received opinion, I believe that conversation at meal-times is a fertile cause of indigestion, as it is almost impossible to masticate the food thoroughly if engaged in an interesting discussion, especially with one of the opposite sex. For example, a portion of food has been introduced in the mouth and mastication is commenced. At this moment your companion asks you a question requiring an answer. There are three courses open to you. You may bolt the food just as it is and answer the lady, or you may answer her with your mouth full and then resume your chewing, or you may let her wait until you have given the thirty-two bites which the late Sir Andrew Clark prescribed for his patients. But as the two latter procedures are considered to be impolite, you have no option but to be satisfied with the amount of mastication already performed and bolt the mouthful.

Defective teeth are responsible for much imperfect mastication of food. In some cases opposing teeth have been lost, in others soreness of the gums or sensitive exposed pulps prevent the act of mastication from being efficiently performed.

When mastication has not been efficiently performed, the

food is not reduced to a sufficiently fine state of subdivision, and consequently the saliva and later on the gastric juice cannot mix thoroughly with it. And the food being hastily swallowed there is not time for the diastatic action of the saliva to be well started before the stomach is reached.

In the stomach the imperfectly masticated food will present a smaller surface area to be acted on by the gastric juice, and in consequence digestion will be prolonged. And as the stomach as a rule does not eject its contents through the pylorus until it has reached a sufficiently fine state of division, it follows of necessity that the total time which the food will remain in the stomach will be prolonged, with consequent increase in the opportunities for fermentation.

As a matter of fact, when mastication is imperfectly performed the saliva is apt to be deficient, as we know that the act itself is one of the chief exciters of the salivary secretion.

For this reason it is a distinct advantage that the conversion of the food to a finely divided condition should take place in the mouth and not be effected by mashing or other analogous process in the kitchen.

The food may be excessive in bulk.

This may be the case with regard to the food as a whole or to one ingredient.

Food when taken in excess may produce indigestion either directly or indirectly. Directly by its sheer bulk in a manner to be presently explained, and indirectly by throwing into the circulation as the result of its digestion large quantities of nutrient material and thus conducing to gouty dyspepsia.

An adult may consider that he is taking sufficient to keep himself in health if he eats in twenty-four hours the equivalent of one pound of meat and two pounds of bread. The

amount required estimated in heat-units will amount roughly to 3,000 calories.

All beyond this is not required for the needs of the organism, and its assimilation puts just so much needless work upon the digestive organs. The nearer a man can keep to this amount the better, provided that he has no personal peculiarities of size, occupation, climate, or state of health, to especially consider. Of course an occasional excess in the matter of diet can do no harm, as the healthy digestive organs have a large reserve of energy, and are or should be seldom worked to their fullest capacity. But, taking it as a general proposition, I think that most of us consume more food than nature really demands, and thus a constant strain is thrown upon the tissues whose function it is to eliminate waste material from the system. And it is quite certain that a person who has always circulating in his blood-current a quantity of nitrogenous substances which are undergoing retrograde metamorphosis is well on the high road to gout and its attendant dyspeptic troubles.

An excess of food may produce symptoms of indigestion by its bulk in several ways.

(*a*) It may unduly distend the stomach and give rise to uneasy sensations ranging from a mere sense of weight and fulness to actual pain.

(*b*) When relatively in excess, to such an extent that sufficient gastric juice cannot be secreted to digest it, digestion in the stomach will be prolonged and often the stomach cannot manage to empty itself before the next meal is due.

(*c*) Food in excessive bulk will mechanically impede the movements of the stomach, with the result that disintegration is imperfect, the food is not properly mixed with the gastric juice, and digestion is prolonged.

(*d*) Excessive bulk of food of a vegetable nature will interfere with its own digestion by increasing the peristalsis in the small intestine. It will thus be moved on before

there has been time for the digestive processes to be completed.

The food may contain substances which retard digestion.

Certain articles of diet which so react upon each other as to produce an insoluble substance often cause indigestion when taken together. A familiar example of this is a raw egg taken in a cup of strong tea. The albumin of the egg combines with the tannin of the tea, with the result that a dense insoluble precipitate is thrown down, absolutely indigestible and chemically allied to leather. This, although it spoils the egg, vastly improves a common rough tea, and there would be no objection to it at all if the egg were strained out and thrown away before the tea was consumed. Strong tea taken with any meat meal will act in the same manner, converting the albumin into a kind of leather. Thus it is obvious that the high tea, which still is not obsolete in some parts of England and in some ranks of society, is about one of the most unhygienic meals which the ingenuity of man could devise.

Claret, coffee, and some other articles of diet appear to have the property of considerably delaying digestion.

The food may be of an indigestible nature.

For practical purposes we may gauge the digestibility of any article of food by the length of time which it remains in the stomach. As the stomach in the ordinary way expels the food into the duodenum as soon as it has been reduced by the act of digestion to a semifluid consistency, we can easily see that if some articles of food remain longer in the stomach it must be owing to the fact that the stomach finds some difficulty in reducing them to that condition in which it will be justified in passing them on to the next compartment of the digestive factory. It may be as well to remark that this is a more scientific test of the digestibility of articles

of food than the common rule of thumb procedure observed by patients of simply noting whether or not any discomfort followed that particular article of food. For not only may food which is quickly digested cause discomfort, but the converse is a matter of common knowledge, and the fact of a substance digesting in four hours instead of three will make very little difference to the well-being of the patient. The subject is chiefly of importance in arranging the frequency of a patient's meals, as we must allow a sufficient time between them for complete emptying of the stomach to take place. And in many cases patients are found to produce severe dyspeptic troubles by taking too frequent meals of substances which take too long a time to digest. The subject of the relative digestibility of foods has had a good deal of attention devoted to it of late years, and several observers have been able to ascertain the time taken for digestion of most of the ordinary articles of diet by the simple process of giving a weighed meal of it to the subject, and ascertaining by means of the tube how long a time elapsed before it completely left the stomach.

The period during which food will remain in the stomach depends upon the length of time occupied by the stomach in reducing it to that degree of comminution as will justify the stomach in passing it through the pylorus. This appears to depend upon several factors:—

1. The degree of cohesion of the food.—If this is naturally great, or if in other words the food is composed of substances which are so hard and tough that they cannot be easily broken up and divided by the act of mastication, the act of digestion must of necessity be prolonged and difficult.

2. The amount of cellulose and allied substances contained in the food.—If the food contain a disproportionate amount of cellulose or other substances which are acted upon neither by the saliva nor by the gastric juice, the disintegration of

the food in the stomach must be impeded and the act of digestion prolonged.

3. The cooking of the food.—The food may be rendered indigestible by bad and unscientific cooking. Whilst cooking when properly performed is of the greatest service in inducing changes in the food which render it more easily acted on by the digestive fluids, the converse can easily take place.

(*a*) The food may be actually rendered tougher by cooking which is either carried on at an improper temperature or continued for too long a time.

(*b*) By processes such as frying, the food may either be saturated with fat or coated with an impermeable layer of grease. In either case neither the saliva nor the gastric juice can readily come into actual contact with the substances upon which they should act, and the food in consequence will be imperfectly digested.

4. The actual sapidity of the food.—The food may be deficient in flavour, the result being that there will be a deficiency in the amount of exciting gastric juice.

5. The hardness of the food.—The food may be of too soft a consistency, and thus not requiring mastication, the amount of saliva necessary to digest the starch will not be secreted.

The food may be of an irritating nature.

The principal substances used as food which may irritate the stomach are the following:—

1. Alcohol. This is a chemical irritant acting by virtue of the power it possesses of extracting water from substances with which it comes in contact. Of this we have a familiar example in the constant use made of alcohol to rapidly dry the gelatin plates used in photography after development and washing. Upon mucous membranes it will act in a similar manner when in any degree of concentration,

especially when taken upon an empty stomach as an *aperitive* before meals. The gin and bitters or other poisons certainly tend to increase the appetite, but only by setting up a mild congestion of the interior of the stomach. And repeated irritations of this description must inevitably end in producing a condition of gastric catarrh. It is more than probable that the gastric irritation set up by the habitual use of alcoholic drinks is also largely due to the impurities which they contain. Whiskies and brandies, even when genuine in character, are often crude, immature, and loaded with fusel oil. When entirely fictitious, as unfortunately there is reason to believe that they often are, they consist of silent spirit flavoured with more or less poisonous trade concoctions. With respect to wines, many of the cheaper hocks are especially to be condemned as entirely innocent of the juice of the grape, and answering admirably the description so appositely given of them by Mark Twain in *The Innocents Abroad* when discussing the wines of the district: "You may know them from vinegar by the label." Liqueurs add to the irritating properties of the alcohol and sugar they contain certain essential oils, mostly of an extremely poisonous nature, upon which their flavour depends.

2. Sugar. It is not generally realized what a powerful irritant is sugar to mucous membranes. Ten per cent. will congest, and twenty per cent. will produce a considerable irritation. All cane-sugar is converted into invert sugar before it can be digested, and this invert sugar (maltose or dextrose) is very much less irritating. In fruits, the sugar is present in this latter form, and in jam the cane-sugar is largely converted into it by the process of cooking. The amount of cane-sugar converted into dextrose in the process of making jam is in direct ratio to the time occupied in cooking. When we take into consideration that it is usual to take equal parts of fruit and cane-sugar in making jam it

will be seen that the importance of the subject cannot be overrated, as unless the material has been subjected to a prolonged cooking a sufficient percentage of cane-sugar to cause gastric irritation will remain unconverted. According to Hutchison, the proportion of cane-sugar in home-made jam is usually about twenty per cent. against a possible fifty per cent. in commercial jams, this being the result of imperfect cooking in the latter. It is therefore not improbable that the almost universal substitution of commercial preserves for the home-made article may be responsible for a great deal of the dyspepsia which is now so prevalent.

3. Food may contain irritating substances generated by certain methods of cooking. This is notably the case in baked meats, which nowadays are offered us as such an imperfect substitute for the joints roasted in front of the fire. The act of baking produces a peculiar effect upon fat, especially mutton fat, converting it into acrolein, a substance possessing properties of a powerfully irritating nature.

4. Articles of food containing a high percentage of the extractives of meat are particularly irritating to mucous membranes. In this category we must place glazes, made gravies, and the products of the stock pot generally.

5. Pepper, horseradish, mustard, chillies, and other condiments, whilst of the first importance in rendering the food appetizing and thus promoting the flow of gastric juice, will when taken in excess and continuously, tend to irritate the coats of the stomach and eventually set up chronic gastritis. We therefore indulge habitually at considerable risk in East India pickles, curry, mulligatawny, or Hungarian gulash.

6. Irritating substances are produced in food as the result of incipient decomposition. This may be in the form of ptomaines or cadaveric alkaloids as in high game, or in the form of fatty acids as we get it in partially decayed, *i.e.* ripe,

cheese. The decomposition products met with in Brie, Camembert, and Mainzer cheese are particularly irritating to the stomach.

7. Certain shell-fish under certain conditions contain an irritant poison, as do some of the mushrooms and other edible fungi.

Of all articles of food the one which combines in itself the greatest number of indigestible qualities, is probably Italian salame. This is a sausage apparently made of raw smoked mule meat forming a mozaic with lumps of rancid fat of doubtful origin and strongly flavoured with garlic. It is served as a *hors-d'œuvre* at most big dinners and Masonic banquets.

The food may be taken at too frequent intervals.

The process of digestion in the stomach occupies a time varying with the kind and amount of food taken at that particular meal, and it is not until the last particle of digested food has passed through the duodenum that it can be said to be complete. If we introduce a fresh meal into the stomach before this has occurred, we start the process afresh and rob the stomach of that rest between two successive digestive periods which it requires and to which it is justly entitled. That this is habitually done is unfortunately a fact, and to prove the statement we have only to pass in review a day in the life of a lady in a good average position in life and see how she systematically violates the hygiene of the stomach.

The day opens with a cup of tea and a little bread and butter in bed. Probably about 8 a.m. This is normally passed out of the stomach in two hours. It is certain therefore that at her 9 o'clock breakfast there will be considerable food residues yet in her stomach. Breakfast will consist of perhaps a kidney (requiring four hours), bacon (requiring three hours), or some fish (requiring three hours). Two hours after

this—at 11 a.m.—it is obvious that the meal is only half digested and that a considerable quantity will be still in the stomach. But she now feels a sense of exhaustion and sinking due to the irritation of the undigested food and the hypersecretion set up thereby. Wrongly interpreting the sensation as hunger and as a sign that the stomach is empty, she attempts to rally exhausted nature with a glass of milk, or a glass of sherry and a biscuit. Lunch at 1.30 is a mixed meal requiring at least four hours for its digestion, yet nevertheless during the afternoon two or three cups of strong tea are taken at the houses of her friends, accompanied by cakes or bread and butter. Dinner-time arrives before the stomach is empty. Thus through the whole day the stomach has not had a chance to empty itself, but has been actively at work vainly attempting to cope with the fresh burdens which are continually put upon it whilst its arrears are yet undischarged. Can we wonder if after a few years of this abuse we find a condition of chronic hypersthenic gastritis? If we did not it would be a miracle, and the days of miracles are past.

It will be as well to say a few special words about alcohol, tea, coffee, and tobacco, as these must so often be taken into consideration as factors in the production of digestive troubles. Although not a food, tobacco is so commonly used and abused that its consideration in this group is a matter of convenience.

Alcohol.

We already have alluded to the fact that alcohol is a direct irritant to the coats of the stomach. But independently of its immediate action upon the stomach, it forms one of the chief causes of gastric disease as met with at the present day, and deserves a more extended notice.

It is unfortunately the fact that the reprehensible practice of taking stimulants between meals is an extremely common one in the age in which we live.

It is not usually for self-gratification and indulgence, but rather as a stimulus to mental exertion, that it is taken in this manner. In a healthy body, when a certain quantity of work either of mind or body has been performed, a sense of fatigue or weariness is perceived, which compels the individual to cease for a time his labour and allow time for Nature to recuperate the organism. Alcohol simply deadens this sense of weariness, and enables a man to go on working without feeling how tired he really is. Stimulants never increase the natural capacity of the nervous system. They can only divert from their legitimate purpose to the work in hand some of the energies which are sorely needed to repair and restore a brain already taxed to the furthest limit compatible with health.

To remove the sense of fatigue by the consumption of alcohol is to close one's ears to the voice of Nature. The weariness of brain or body is a protest against further exertion until recuperation has been obtained by rest, and if the weary feeling be deadened or destroyed by adventitious means, Nature will exact her penalty. Exhaustion of the nervous system is most dangerous when it cannot be perceived, and the man who deliberately rouses his jaded faculties to excessive exertion by alcoholic excitement makes a call on his reserve energies which he will assuredly find it difficult or impossible to repay. And the nervous exhaustion which is thus produced is at the root of many severe cases of dyspepsia.

The foregoing remarks apply chiefly to those who indulge in spirits or the stronger wines. The dyspepsia of beer-drinkers is caused in a different manner. In this case it is not so much the alcohol which works the mischief as the introduction into the stomach of large quantities of cold (perhaps iced) liquid, containing a large percentage of acetic acid. The effect is that the gastric contents are diluted, the nerves of the stomach are inhibited by the

cold, dilatation is produced, and the acetic acid fermentation set up.

One must, however, not lose sight of the fact that when regarded as a medicinal agent rather than as a food accessory, alcohol is of undoubted value in the treatment of diseases of the stomach. As far back as 1760 and 1846, investigators (among whom were Gosse and Frerichs) had arrived at the conclusion that alcohol promoted the secretion of the gastric juice; but later experiments with artificial digestive processes *in vitro* appeared to negative their conclusions. It was found that when alcohol was added to a meat solution, digesting in a beaker over a water bath, a delay was effected in the process. This varied from a slight slowing to an entire arrest of the process, according to the quantity added, and it was therefore erroneously concluded that the same held good of digestion in the human stomach. But later and more careful researches have demonstrated beyond a doubt that such was not the case. The fact has been established that alcohol, when taken into the stomach along with the food, has two periods or phases of action. During the first of these the digestion of albumin is impeded. But after the alcohol has been absorbed a second stage ensues, in which the secretion of HCl increases to two or three times the amount which would otherwise be the case. And this amount varies up to a certain point directly with the amount of alcohol taken. After the stomach digestion is completed, the secretion of HCl also continues longer than in cases where no alcohol has been taken. This, it must be noted, only applies to the healthy normal stomach. Alcohol does not appear to have this stimulating effect in pathological conditions in which there are alterations in the composition of the gastric juice.

Alcohol also has the power of increasing the peristaltic movements of the stomach. This latter fact agrees with the results of my own observations. I have often found that

cases of extreme flatulence and discomfort due to abnormal retention of food were promptly relieved by a dose of alcohol, generally without any especial belching of wind. In these cases I have determined in several instances that the stomach was filled with solid and fluid materials rather than with gas, and the relief has in consequence been explained on the hypothesis that the alcohol stimulated the stomach to contract, and to expel the offending contents into the duodenum.

We may, I think, sum up the injurious effects of alcohol by stating that—

1. It acts as a local irritant, producing dilatation of the vessels of the stomach and subsequent chronic gastritis.

2. It leads to hyperacidity by stimulating the secretion of hydrochloric acid.

3. The tartrates and malates contained in wines are decomposed in the stomach, setting free organic acids, and thus producing hyperacidity due to organic acids ("organacidia," Knapp).

4. The acetic acid and yeast in beer set up the acetic acid fermentation in the stomach contents.

5. Alcoholic drinks when taken in bulk eventually produce dilatation of the stomach.

Tea.

Indigestion resulting from the use of tea is most frequently met with among the lower classes, who are in the habit of drinking large quantities of a very inferior quality In addition to the action of the tannin upon the albuminous constituents of food, already mentioned, excessive tea-drinking sets up digestive troubles:—

1. By its action upon the nervous system, acting in a manner very similar to tobacco.

2. By diluting the contents of the stomach below the point of concentration at which digestion can efficiently take place.

3. By the undoubted tendency that constant distension with hot liquids has to produce atony of the stomach walls.

Tea is most injurious to neurasthenic persons, many of whom have a special idiosyncrasy to it Some years ago I had under observation a patient who invariably suffered acutely after indulging in a single cup. About an hour afterwards he would experience a feeling of great oppression, with difficulty of breathing and pain and sensation of clutching at the throat. These symptoms were the immediate result of distension of the stomach with wind which was produced in some manner through the agency of the nervous system.

Coffee.

Both tea and coffee were found by Roberts[1] to exercise a powerful retarding action upon peptic digestion Coffee especially acts more energetically than tea, as it is usually taken much stronger. As a result of many and careful experiments made with artificial digestion in the laboratory, it was found that a mixture of meat, pepsin, and hydrochloric acid which normally took 100 minutes to digest, would require 180 to bring it to the same stage if it contained 40 per cent. of coffee of 5 per cent. strength. With a coffee of 15 per cent. strength almost no digestive action of any kind took place. With the strong coffee (*café noir*) so often taken after dinner, as small a proportion as 10 per cent. would very materially reduce the speed of digestion, and with 20 per cent. digestion was very much embarrassed. It is thus certain that the ordinary use of coffee as a beverage must interfere greatly with digestion in the stomach.

In addition to its retarding effect upon digestion, coffee is a powerful irritant to some stomachs, especially if it is roasted to a dark colour. This is ordinarily done to improve

[1] *Digestion and Diet*, p. 139, by Sir William Roberts London, 1891.

the colour of the decoction. Lightly roasted coffee is much less harmful, and may usually be taken with comparative impunity if not too strong.

Tobacco.

Excess in smoking is a relative term. Whilst some people are exceedingly tolerant of tobacco, others can only use it in the most extreme moderation without experiencing ill effects. Dyspepsia is often produced by tobacco when used to the extent which is excess to the particular individual. Tobacco increases the secretion of saliva, reduces the appetite probably by its action upon the epithelium of the tongue, dulls the sensation of hunger by its narcotic action upon the nervous system, increases the peristaltic movements of the intestines, and acts as a direct irritant to the mucous membrane of the stomach. It is also a potent factor in the production of general neurasthenia with its resulting digestive troubles. One of the commonest conditions produced by it is hyperchlorhydria, and I have also seen attacks of continuous hypersecretion occurring in a smoker which resisted all treatment, but disappeared as soon as the habit was abandoned. In many neurasthenic patients it will set up a severe infra-mammary pain on the left side which is relieved by eructation of wind. There can, I think, be no doubt but that chronic gastritis is occasionally directly caused by excessive use of tobacco. This is especially the case in those who chew or who swallow their saliva, and I think that if the recent regulations against spitting come into force we may expect to see an increase in the number of these cases. Even if in some particular case a gastritis may not have been originally caused by tobacco, yet the habit of smoking may prevent it from getting well under treatment. I have been frequently struck with the fact that I have been unable to cure patients with chronic gastritis as long as they continued smoking, and that in these cases it was not sufficient to

reduce the amount. Nothing short of the complete abandonment of the habit was effective.

The indigestion arising from improper food may be acute or chronic. We will study these in order.

ACUTE INDIGESTION FROM ERRORS IN DIET.

This is not at all an uncommon affection, especially in the summer, and may be met with in all stages of severity. In its acuter forms it must certainly be classed as a gastritis although in the milder cases which form the bulk of those seen in daily practice we are not justified in assuming anything but an intense irritation. Although it may undoubtedly be the result of food simply excessive in bulk or of an indigestible nature, it is very frequently caused by tainted food in which decomposition is commencing. Thus, I have seen it occur after eating sardines, Italian salame, and pigeon pie a couple of days old. When it takes place after the ingestion of food merely excessive in bulk, it is probable that the patient's stomach is not quite sound, there being either some slight degree of atony or some chronic gastritis.

This affection may be met with in several clinical forms of which the following are the principal :—

The discomfort may be mainly stomachic, and may terminate by vomiting.

The following case is an example of this form, and is frequently met with in practice. The patient, a middle-aged man, had had his stomach more or less upset all day, as the night before he had attended a public dinner where he had taken a good deal of champagne, and had afterwards indulged in several glasses of whisky and five or six cigars, going to bed very late. On the evening of the attack he

ate a hearty supper of cold meat, salad and cucumber, jam tart and cream, and took a bottle of stout. He retired to bed about eleven feeling very tired, and at once went to sleep, but woke up about twelve feeling extremely ill. He experienced an intolerable feeling of distension in the lower part of the left chest, and felt very sick. Uneasiness in the abdomen soon followed, and a sensation as if his breathing were going to stop, each breath being drawn with a conscious effort. Belching began and became incessant, but with only temporary relief. Very soon he broke into a profuse perspiration accompanied by faintness. After remaining a couple of hours in this miserable condition he vomited, and feeling relieved shortly went to sleep and woke up in the morning in his usual health.

Here we have a picture of a very common kind of indigestion, but of an interesting and instructive nature. If we analyze the symptoms we may divide them into two groups:—

(*a*) Symptoms caused by actual distension of the stomach and its consequent upward pressure upon the diaphragm.

These conditions will account for the feeling of distension and partly for the difficulty of breathing.

(*b*) Symptoms due to poisoning by the products of abnormal fermentation in the stomach viz. the eructations of wind, the nausea faintness, and the dyspnœa, which last symptom being out of proportion to the mechanical result of the distended stomach must be due at least in part to poisoning of the respiratory centre.

In this case the termination of the attack by vomiting was the most fortunate thing which could have happened to the patient. For if, as sometimes happens in these cases, it had not taken place, the result would have been that when the stomach had emptied itself into the duodenum a simple change of venue would have taken place, further putrefactive changes occurring in the mass of fermenting material

thus introduced into the intestine. The patient would probably under such circumstances have suffered all the next day from auto-intoxication, and the symptoms would have persisted until nature had relieved him of the peccant material by a sharp attack of diarrhœa or the doctor by a dose of castor oil.

It is a curious feature in these cases that the contents of the stomach come up with very little fluid, no matter how much has been taken at the meal which caused the trouble. In many cases the patient only vomits once or twice, but in others retching may continue for some hours and the convalescence be correspondingly prolonged. In other cases a condition of gastric catarrh may remain for some days, and it may be perhaps a week before the patient regains his usual health.

It is most important in these cases that a correct diagnosis be made, and that the patient should not be assumed to be merely suffering from an acute dyspepsia without a proper investigation. The commonest condition with which acute indigestion may be confounded is the acute attack of gastric insufficiency which marks the progress of a slowly stenosing pylorus.

Cases in which the trouble is confined to the intestines.

It not unfrequently happens that the stomach is able to pass on its undigested contents into the duodenum and transfer the onus of dealing with them to that viscus. This condition will be most probably met with in cases of chronic gastritis accompanied with hypochlorhydria, in which the musculature of the stomach is very vigorous. As in these cases from the absence of hyperacidity spasm of the pylorus will not occur, it is quite possible for the undigested food to be hurried out of the stomach before any marked fermentation has taken place.

The first symptom naturally will be pain, at first probably in the region of the umbilicus, later on following the course of the colon. During a spasm of pain the colon can usually be felt to spasmodically contract under an examining hand. After a longer or shorter interval diarrhœa will set in, and then either the attack will promptly come to an end after the passage of one or two loose stools, or intestinal disturbance of a subacute type may persist for one or two days. It is important not to mistake gastric indigestion occurring in a ptosed stomach for intestinal dyspepsia. A fact which I have not seen mentioned in the text-books is that these cases of intestinal indigestion are not unfrequently attended by distinct rigors and a rise of temperature. In fact, in many cases these symptoms are the only ones until the occurrence of the loose stool which ends the attack. The following is a typical case selected from a number of which I have notes :—

The patient, a middle-aged man, retired to bed in his usual health, but was unable to get to sleep. Between one and two o'clock he began to get restless and to experience a general feeling of malaise associated with some slight starting of the muscles of the legs. He shortly began to feel chilly and ill, and distinct rigors developed. During the attack his temperature rose to 101° Fahr. At the end of half an hour or so the rigors began to lessen in severity, the patient began to perspire and become more comfortable. Then followed a loose motion of the bowels, the stool being frothy and very offensive, and the patient went to sleep. This particular patient has had several precisely similar attacks, each occurring about an hour after going to bed, and on nearly every occasion he has been able to trace it to some particular indigestible article of diet in which he had indulged during the previous day.

Cases in which pain is a marked feature and which do not terminate by either vomiting or diarrhœa.

In some cases the pain is, I think, due to spasm and cramp of the pylorus, resulting from a hyperchlorhydria set up by the irritating food. In other cases the cramp may be the direct result of a meal at which a large quantity of acid wine has been taken, the pylorus simply carrying out its rôle of preventing the acid stomach contents from reaching the duodenum.

In these cases the pain is often of a two-fold character, first the pain due to the hyperchlorhydria itself, secondly the cramp of the tightly contracting pylorus.

Cases marked by both vomiting and diarrhœa.

During attacks of this nature the patient may be in a condition of extreme distress and possibly of considerable gravity, the vomiting and diarrhœa being continuous and attended by collapse.

Cases in which the prominent symptom is faintness.

The form of indigestion in which faintness is practically the only symptom is not very common, but is occasionally met with. The following is an illustrative case :—

Mr. J., *æt.* forty-seven, a man in good health, but with a stomach rather easily overtaxed, lunched at 1 p.m. on December 19th, 1903, at a small French restaurant in a turning off Wardour Street. His repast consisted of half a dozen eschargots, a mutton cutlet, escarole salad dressed with oil and vinegar and containing a piece of garlic, apple tartlet and cream, Roquefort cheese, a large bottle of lager beer, a cup of coffee, and a cigar and a liqueur. Such a meal as this, comprising such a careful selection of indigestible articles, would require a strong stomach in order that it might be indulged in with impunity. About 4 p.m. the patient com-

menced to feel very faint and had the greatest difficulty in carrying on his work, which was that of a gas collector. By 6 p.m. he was so bad that he had to go home and lie down. Shortly after this he fainted and was unconscious for several minutes. I saw him at 7 p.m. and found him in a state of collapse. Copious vomiting was induced by means of a suitable emetic, the patient promptly recovered, and by the next morning was in his usual health. The vomit contained nearly the whole of his lunch in an undigested state.

The treatment of acute indigestion will vary with the circumstances present in the individual case and the stage at which the patient is seen.

Medicinal treatment of acute indigestion.

When the affection is obviously stomachic, as shown by the severe pain, associated with loss of appetite, vomiting, and nervous symptoms, either of a reflex nature or due to the absorption of toxines, the first indication is to rid the stomach of the offending material and thus if possible prevent the extension of the irritation to the intestines. If fortunately vomiting has already taken place, nature will have accomplished this for us in a more or less perfect manner. But even under these circumstances it will be sound practice not to check the vomiting, but to encourage it for a short time by the administration of one or two glasses of hot water or of infusion of chamomile. Chamomile, I may say *en passant,* is a good old household remedy which has suffered unmerited neglect in these latter days of popular science.

If the patient has not vomited when we first see him, we must proceed to empty the stomach with as little delay as possible. A harmless method of doing this, and one which will often succeed, is that suggested by Mitchell Bruce.[1]

[1] *The Principles of Treatment,* p 453, by J. Mitchell Bruce London, 1899.

This consists in giving successive glasses of water at 85° Fahr. until vomiting takes place, then yet one glass more to induce a fresh emesis, and finally a glass containing a teaspoonful of bicarbonate of soda to complete the solution of any mucus which may be present. In my own practice I am in the habit of giving this last tumbler at a considerably higher temperature, as our object is not now to provoke any further vomiting, and I think that a teaspoonful of aromatic spirit of ammonia may usefully be added to it.

We may produce emesis also by simply irritating the back of the fauces with the finger, or by administering one or two cupfuls of chamomile tea, a tablespoonful of mustard in a tumbler of warm water, thirty grains of either powdered ipecacuanha or of sulphate of zinc.

After the stomach has been thoroughly emptied we must administer a purge, and undoubtedly the best one is calomel in a dose of three to five grains. We must be very particular not to purge until we are sure that the stomach is empty, or we shall make matters worse by driving the decomposing mass from the stomach through the intestines. As regards the dose of calomel, it is a fact well known to the last generation of practitioners, when calomel was used to a much greater extent than it is at present, that less disturbance is produced by a full dose of the drug than by a small one. Whilst a dose of three grains will act promptly and efficiently, a small one of a grain or so will worry the patient for some hours with constant griping and tenesmus unless at the same time a saline purge be also administered. If therefore we elect to give a small dose, we should always follow it after a few hours by a dose of Epsom salts or a seidlitz powder. Either of these should be given in hot water.

The great advantage of calomel lies in the fact that in addition to rapidly clearing out the upper bowel, it is probably the most efficient intestinal antiseptic with which we are acquainted. If we think that in the particular case under

treatment mercurials are contra-indicated, we may give instead either a couple of ounces of Rochelle salt in a tumbler of hot water, or the same amount of the ordinary Mist. Sennæ Co. of the hospital pharmacopœias.

The further medical treatment will depend upon the symptoms which are present. When vomiting continues after the contents of the stomach have been evacuated, we may with advantage give an effervescent mixture containing ammonia and two or three minim doses of dilute hydrocyanic acid. At the same time a sinapism or hot fomentation applied to the epigastrium will prove of great benefit. In cases where severe pain in the stomach continues, we should not hesitate to administer small doses of morphia either subcutaneously or by the mouth.

A suitable formula for the effervescing mixture will be the following:—

R. Sodæ bicarb. gr. xv
Ammon. Carb. gr. iij
Acid Hydrocyanici dilut. m. iij
Spirit. Chloroformi m. x
Aquæ ad oz. jss

Misce. Fiat haustus quartis horis sumendus in effervescentia cum acid. citric. gr. xv.

When the trouble is mainly intestinal, the treatment must proceed on different lines. In these cases the patient has escaped vomiting, and the stomach has succeeded in emptying itself into the duodenum. Such cases are often accompanied by more constitutional disturbance than those in which vomiting has occurred, and we frequently meet with slight rigors and rise of temperature. Under favourable circumstances such an attack is self-limiting, being terminated by an attack of diarrhœa. When called to such a case the first thing to do is of course to make sure that we are dealing with a simple indigestion. Having satisfied ourselves upon this point, our obvious indication is to empty

the intestines as quickly as possible. To meet this indication nothing is better than castor oil, as its action is quicker than calomel, and in addition to its action in clearing out the bowel it exercises a sedative influence upon the irritated intestine. The following method of giving castor oil is not so well known as it deserves to be. Take an ordinary medicine bottle holding six or eight ounces, into it measure the dose of castor oil, then fill half full of hot milk, insert the cork, and shake briskly for a few minutes. At the end of this time the oil will have disappeared, having formed a perfect emulsion with the hot milk. Given in this way castor oil is practically tasteless, and does not hang round either the mouth or the glass in which it is given. After the oil has acted the patient should be given a simple bismuth mixture, with perhaps a little morphia if pain is a prominent symptom. If the diarrhœa persists, an astringent preparation of bismuth such as the subgallate should be selected.

Dietetic treatment of acute indigestion.

In all cases of acute indigestion, whether gastric or intestinal, the main point as regards the diet is to enjoin complete abstinence from food for from twelve to eighteen hours. During this time the patient may suck small pieces of ice or take occasional sips of hot water if thirst is excessive. If there is great prostration, but not otherwise, small quantities of well-diluted brandy or a little dry champagne may be cautiously given.

After the acute symptoms have subsided, any of the following articles of diet may be given in small doses every four hours :—

Milk and soda water, milk and lime water, veal broth, chicken broth, barley water, rice water, or thin soup.

In cases where vomiting persists it may be very difficult to find anything which the patient can keep down. Under

these conditions one may often give with advantage the white of an egg beaten up with a little hock or even with plain water. Meat juice and soda water will often be retained when everything else is rejected.

In many cases the patient will be practically well as soon as the contents of the stomach have been evacuated, and may be allowed to return to ordinary diet. In more severe cases, however, he should be kept upon a restricted régime for a few days, and only gradually be allowed to resume his ordinary manner of feeding. The following may be taken as an example of the kind of diet table to be furnished to such a patient.

At 10 o'clock. A small glass of milk and lime water, or a cup of beef tea, with a small piece of toast.

1 o'clock. A cup of soup or beef tea, with a little toast.

4 o'clock. A cup of thin cocoa, made with half milk, or a cup of weak tea, and a thin slice of bread and butter.

7 o'clock. A basin of soup or broth.

9.30 o'clock. A cup of water arrowroot with a teaspoonful of brandy in it, or a glass of milk and lime water.

Mellin's food, peptonized milk, or milk gruel may be substituted for any of the above articles. As convalescence approaches, the patient may be allowed purées of meat or chicken, lightly boiled eggs, boiled soles, or raw oysters. The normal diet should only be resumed by slow degrees.

The study from a clinical standpoint of the irritation produced by dietetic errors is of immense importance to us as medical men, taking into consideration the large percentage of digestive troubles which owe their origin to them. It is a remarkable fact that the effects produced by the continual irritation of the stomach are not constant, but vary according to some law at present unknown to us. The first effect of continuous irritation of the stomach is to produce one of the following conditions:—

(*a*) An increase of the secretion of hydrochloric acid

during the digestive period (hyperchlorhydria); (*b*) An increase of the gastric juice as a whole (hyperchylia); (*c*) A hyperæsthesia of the stomach; (*d*) A continuous secretion of gastric juice not confined to the digestive period (continuous hypersecretion).

We may take it that up to this point the effect of the irritation has been to produce merely a disorder of function. But if the irritation continues, anatomical changes will take place, which also may progress upon divergent lines in different cases. For we may have—

(*a*) A parenchymatous inflammation affecting the secreting glands of the gastric mucosa (chronic proliferative gastritis, hypersthenic gastritis, or acid gastritis); (*b*) An interstitial inflammation attended by proliferation of the connective tissue with consequent degeneration in the secreting gastric tubules (chronic interstitial or asthenic gastritis).

Later on we may have as final stages of both of these forms of chronic gastritis, either—(*a*) Muscular atony of the stomach wall (myasthenia gastrica), or (*b*) Atrophy of the secreting glands of the mucosa (chronic atrophic gastritis).

Clinically the commonest conditions arising from these processes are hyperchlorhydria, hypersecretion, chronic interstitial or asthenic gastritis, and atony, and the scope of this book will render it necessary that we should confine our study to these. The first three will be discussed in this chapter, as arising in many cases directly from the irritation of improper food. Atony will be studied in chapter iv.

HYPERCHLORHYDRIA.

When this condition has been well established the gastric juice will habitually contain a larger amount of hydrochloric acid than normal during the digestive period, and the symptoms present will be directly due to the irritation of the hypersensitive mucous membrane of the stomach by it.

The course of the affection is gradual, the symptoms increasing in intensity as the disease progresses.

Symptoms of Hyperchlorhydria.

The first symptom to arrest the attention of the patient is usually a sensation of pressure in the region of the stomach, associated with a slight sensation of heat or tingling. In this case it is not at all unusual for the patient to be actually conscious of the peristaltic movements of the stomach, which are probably excessive. After these symptoms have continued for a variable time, sometimes worse and sometimes better, the patient will begin to bring up a good deal of wind after meals, perhaps accompanied by a mouthful of an acid liquid. Usually the acid regurgitation does not reach as far as the mouth, only rising a little way up the lower end of the œsophagus and producing the burning sensation behind the sternum which we know as pyrosis or heart-burn. A little later on there will be distinct pain coming on about an hour after food, lasting a variable time, and relieved by taking more food or by the administration of alkalies. Many cases never get any worse than this, and suffer from attacks of indigestion accompanied by these symptoms every few weeks, each attack lasting a few days and being separated by periods of apparent health.

The symptoms may in some cases come on gradually; in others attack the patient suddenly after a meal. It is a peculiarity that whilst in most cases symptoms will only occur after a large mixed meal has been taken, in others the converse is the case, large meals being taken with comparative impunity, whilst small ones are invariably followed by the usual suffering. The reason for this is that probably in these patients the amount of free hydrochloric acid which is secreted is far in excess of that required for combination by a small meal; but nevertheless it is possible

to take a meal of such a size as will more than combine with the total acid and leave no free hydrochloric acid in the stomach.

In the milder degrees of hyperchlorhydria vomiting is comparatively rare, it being as a rule met with exclusively in those cases in which severe pain, approaching cardalgia in intensity, is present.

In the severer forms of hyperchlorhydria the pain is lancinating and constrictive, and may be sufficiently intense to almost "bend the patient double". It is, under these circumstances, often called cramp by the patients, and is in fact really due to a true spasm of the pylorus, which is thrown into a state of tetanic contraction in the effort to prevent the hyperacid contents of the stomach from reaching the duodenum. The position of the pain is usually in the epigastrium and left inframammary region, but it is occasionally felt to the right of the middle line in the region of the gall bladder, being under these circumstances not unfrequently mistaken for an attack of gall-stones. In other cases it may be felt right through to the back. Such an attack will often terminate by severe vomiting, by which the pain is temporarily relieved.

The following is a brief account of a typical case of hyperchlorhydria:—

E. R., a married woman, aged twenty-nine, came to my out-patient clinic on December 18th, 1893. She had had three children, the youngest of which was six years old. Had never suffered from any serious illness until three months ago, when she commenced to be troubled with her stomach. Has been very irregular in her diet, which has been coarse and poor, and has consisted largely of tinned meat, pickles, and tea. *Symptoms*:—She complains chiefly of a burning sensation at the pit of the stomach, which comes on about two hours after dinner and occasionally at night. After breakfast she does not as a rule suffer any-

thing beyond a slight feeling of weight and uneasiness. At the height of the attack she frequently brings up into the mouth a small quantity of acid fluid, which "sets her teeth on edge". Sometimes this regurgitation is followed by temporary relief, at other times not. She never vomits spontaneously, but often makes herself sick by putting her finger down her throat for the sake of the relief which follows emesis. The duration of the pain is variable, sometimes lasting until the next meal, and sometimes passing off in an hour or so. It is always relieved by taking food or by a teaspoonful of bicarbonate of soda. She suffers considerably from flatulence both before and after breakfast, is constipated, and subject to severe headache. She is also anæmic and has considerable shortness of breath on exertion. *Physical signs*:—No apparent dilatation of the stomach. Total acidity an hour after an Ewald test meal, 100, with free hydrochloric acid 70. No abnormal amount of mucus. *Diagnosis*:—Hyperchlorhydria. *Treatment*.—Regulation of the diet, an alkaline powder consisting of equal parts of bicarbonate of soda and carbonate of magnesia two hours after meals, and Blaud's pills night and morning. *Result*:—Recovery after two months' treatment. When examined six months after the termination of the treatment total acidity was 70, with free HCl 50 after an Ewald test breakfast.

Diagnosis of Hyperchlorhydria.

Whilst we may strongly suspect this condition from the presence of the characteristic symptoms enumerated, the absolute verification will hinge upon finding an excess of hydrochloric acid in the stomach after a test meal. For further information upon this point the reader is referred to chapter vii.

Treatment of Hyperchlorhydria.

In the present chapter we shall confine ourselves to the treatment of hyperchlorhydria, the result of local irritation, leaving for discussion in the chapter devoted to gastric neurasthenia the management of those cases which are purely of a neurotic nature. The indications to be followed for successful treatment are—

To place the patient upon a diet which whilst offering the greatest possible combining power for hydrochloric acid shall contain the minimum of the substances which can provoke the secretion of gastric juce, to neutralize the excess of free acid in the stomach, and to take measures to diminish the secretion of hydrochloric acid.

(*a*) *Diet.*—In the first place, everything which can irritate the gastric mucosa must be interdicted. We therefore cut off pepper, mustard, vinegar, pickles, salads, spices, sauces, coffee, strong alcohol, acid wines, and substances such as radishes which are difficult of fine subdivision by mastication.

Secondly, we eliminate as far as possible from the diet those substances which act as natural excitants to the gastric juice. We therefore do not allow the patient to commence his meal with strong soup, which we remember will act as a substitute for the exciting gastric juice in cases in which it is deficient, and we forbid the use of made gravies and the products of the stock-pot generally. Thirdly, we diminish the amount of farinaceous food, since we have learnt that a small quantity will usually be perfectly digested, whilst in the same cases a large amount will remain unchanged.

The diet then must consist mainly of nitrogenous food, both because it is easier digested, and also for the reason that it possesses the advantage of entering into combination with hydrochloric acid, and in this manner diminishing the amount of free acid in the stomach. Any kind of meat may

be taken, the preference being given to the kinds containing the smallest amount of extractives. We may therefore order veal, chicken, pigeon, sweetbread, and brains, in preference to beef and mutton, although the latter have a far greater combining power for acid. There will, however, be no necessity to deny the patient butcher's meat altogether, and he may be allowed a moderate amount of underdone mutton or beef plainly roasted, grilled, or boiled. Eggs and milk should form an important part of the dietary, as they are rich in albumin and have in consequence a high combining power. In fact, at the commencement of a bad case it may be as well to limit the diet for a few days to raw eggs beaten up with milk, giving as many as eight or ten during the twenty-four hours. Patients often find out for themselves that eggs and milk have a high combining power for acid, and are in the habit of taking a beaten-up egg two hours or so after food to dull their pain. When milk is taken by a patient the subject of hyperchlorhydria it must be always sipped very slowly, in order that it may be curdled in fine flakes and not in a solid lump, as would very likely happen if taken at a gulp. In these patients the rennin is always in excess and consequently the curdling process very energetic. This fact explains the assertion of most sufferers from this complaint "that they cannot take milk as it always makes them bilious". These patients usually describe an attack of acute indigestion as "biliousness".

We learn from this the important lesson not to credit the statement of a patient that milk does not agree until we have tried the effect of giving it in sips. Plenty of green vegetables should be allowed, given invariably in the form of a purée,[1] a small quantity of potato also in a fine state of subdivision, and thick vegetable soups made without the use of meat stock (*i.e.* from a stock of a vegetable nature

[1] For the preparation of these and other articles of diet mentioned in the book, the reader is referred to the Appendix.

or from fish stock). Cane-sugar is to be avoided, as it exercises a powerfully irritant action upon the gastric mucosa, replacing it whenever possible by sugar of milk. This, although it has not the same sweetening power, is harmless. Dextrose apparently does not stimulate the secretion of hydrochloric acid nor irritate the stomach, and for this reason we may make use of one of the farinaceous foods now upon the market in which the starch has been converted into this substance. Bread must be cut thin and well toasted. We may allow the patient a considerable amount of fluid, both because by diluting the hyperacid gastric juice it will allay pain, and also because it will favour the process of digestion, which is retarded if the contents of the stomach are unduly concentrated. The patient may drink plain water either still or aerated, milk and water, or claret and water. Weak tea is usually unobjectionable, but strong tea, strong wines, effervescing wines, spirits, liqueurs, and coffee are to be absolutely avoided. As we wish to secure as much functional rest for the stomach as possible, only three meals must be taken during the day, with an interval of five hours between each. Nothing whatever must be taken between them, however great the temptation.

(*b*) *The neutralization of the excess of free acid in the stomach.*—This the second indication for treatment is important, both to relieve the pain and to protect the stomach from the injurious action upon it of the excess of acid. It has moreover been ascertained experimentally that alkaline treatment continued for a sufficient time tends to permanently check the tendency of the gastric glands to over-secretion, and thus effect a real cure of the disease.

The alkali selected should be given at the height of digestion, that is to say, about two hours after meals, in a single large dose. A mixture of bicarbonate of soda with other drugs, having a greater combining power, appears

to produce better results than bicarbonate of soda by itself. The following are a few eligible formulæ:—

R. Sod. bicarb.
Cretæ præp.
Mag. carb. āā part. æq. M.
Sig.—An eggspoonful to be taken three times a day two hours after meals, stirred up in a little water.

R. Magnes. ustæ ℥jss
Sodii bicarb. ℥ss M.
Sig.—Half a teaspoonful to be taken three times a day half an hour after food, stirred up in water.

R. Sodii bicarb. ℥j
Bismuth Carb. ℥ss
Mag. Carb. Pond. ℥j
Ammon. Carb. gr. 120
Spt. Menth. Pip. m. xxx. M.
Sig.—An eggspoonful to a teaspoonful to be taken two hours after meals, stirred up in water.

(*c*) *To diminish the secretion of hydrochloric acid.*—As we have already stated, this indication is carried out to a certain extent by the alkaline medication described in the last paragraph. In certain cases other measures may be necessary. For this purpose we may make use of—

Nitrate of silver.—This has been employed in solution (gr. ¼ to gr. ½) in pill or capsule (gr. ¼) or as an intragastric spray in a strength of 1 : 1,000,[1] and in suitable cases will often give the best results.

Antropine.—This drug in minute doses will usually diminish the secretion of hydrochloric acid in a remarkable manner, but the results are not permanent and it should be only used as a temporary expedient.

[1] *Vide* the Author's work,—*Manual of Intragastric Technique* London, J H. Glaisher, 1903

Bromine, chloral, cannabis indica.—These drugs often are extremely useful, my own favourite being a mixture of hydrobromic acid and cannabis indica. Small doses of chloral given in solution shortly before meals will also in many cases succeed in markedly diminishing the secretion of acid.

Electricity.[1]—This is in my opinion the most potent agent which we possess for the purpose of quieting the gastric glands, provided that we make use of the intragastric application of the high tension induction coil current, or the triphase sinusoidal current.

In conjunction with suitable diet, alkalies, and hygiene, we can often cure cases which have otherwise proved intractable. The following three cases illustrate the results often obtained :—

Mr. E. V. L., aged thirty-six. June 12th, 1902. Pain after food since nine years of age. Latterly very severe, pain usually comes on shortly after a meal, and continues for two or three hours. This happens chiefly after the midday meal, occasionally after breakfast. *Objective:* After Ewald test meal total acidity = 90, free HCl = 60, C = 30. *Diagnosis:* Hyperchlorhydria. *Treatment:* Induction coil current from 1,500 yards of No. 36 wire, with external and intragastric electrodes. *Result:* After six weeks' treatment pains have ceased, and the free hydrochloric acid averages 40.

Mrs. T., aged thirty-four. October 31st, 1902. Pain after food for the last six years ; three years ago had hematemesis. *Present symptoms:* Pain an hour after food ; constipation. *Objective:* No tenderness on pressure ; no thickening ; after Ewald test meal total acidity = 90, free HCl = 70. *Treatment:* Current from high tension induction coil by intragastric electrode ; lavage. *Result:* Cure in two months, the result of a test breakfast showing total acidity = 60, free HCl = 45.

[1] For further details *vide* the Author's work,—*Electrical Methods in the Treatment of Affections of the Stomach and Intestines* London, A Siegle, 1905.

Miss P., aged thirty-two. February 21st, 1903. *Symptoms:* Pain after food. *Objective:* Considerable hyperchlorhydria. Total acidity = 100, free HCl = 80. *Treatment:* The intragastric application of the induction coil current from 2,000 yards of secondary windings, with at the same time appropriate diet. *Result:* After three months' treatment total acidity = 55, free HCl = 50.

Electricity should never be tried upon any case of hyperchlorhydria unless these particular currents are available, and not even then except the services of an operator can be secured who is accustomed to the manipulation of intragastric instruments. Otherwise disappointment is certain, or the disease may even be aggravated.

In purely functional hyperchlorhydria all intragastric measures of treatment are best avoided. Lavage in particular is not indicated, as there are no residues of any kind which require to be washed away. In hyperchlorhydria the result of chronic proliferative or sthenic gastritis, however, lavage is almost indispensable for the successful conduct of the case, and the most favourable results are constantly seen to follow systematic irrigation with weak alkaline solutions.

HYPERSECRETION.

A sharp distinction should be drawn between hyperchlorhydria and hypersecretion. In hyperchlorhydria there is an increase in the amount of hydrochloric acid present in the gastric juice during the digestive periods; in hypersecretion there is a continuous flow of gastric juice, which does not cease to be secreted during the intervals which elapse between them.

The exciting causes of hypersecretion are practically the same as those of hyperchlorhydria when met with as a primary disease of the stomach, but it may also in some cases be a pure neurosis, or may exist as a complication of

motor insufficiency. I am gradually coming to the opinion that this last form is the one which is met with most frequently in practice. The stomach does not empty itself, and consequently a small amount of food residues are always present, which keep up a constant secretion of gastric juice.

The treatment of this form will be studied in the next chapter, which deals with atony of the stomach.

Symptoms of hypersecretion.

The symptoms of typical hypersecretion differ considerably from those of hyperchlorhydria, and form an ensemble which enables a practised observer to form a correct diagnosis from them alone. It is, however, never safe to omit rendering our diagnosis absolutely certain by the simple test of finding hydrochloric acid in the stomach at a time when it should properly be empty. The appetite is usually good, often excessive, the patient feeling hungry even when the stomach contains food. This is directly due to the excess of acid, and is not distinctive as it is met with also in hyperchlorhydria. What is more characteristic is a sense of sinking before meals, becoming actual pain if food be not taken. A keen sense of hunger is also frequently experienced in the middle of the night, which prevents the patient from sleeping unless he takes some food. Patients often feel that they want to eat again a short time after a meal. As in hyperchlorhydria, food rich in albumin will allay the uneasy sensations for a time. Pyrosis is not so frequently met with as in hyperchlorhydria. Pain has the same time relation to food as in hyperchlorhydria, but it has a tendency to become continuous and to occur in the middle of the night. When it attacks the patient at night it usually lasts for two or three hours and often terminates by vomiting. Some few cases end without vomiting and some with a few loose stools. This nocturnal diarrhœa, associated with gastric pain, is a valuable sign of continuous hypersecretion, pro-

vided that acute dyspepsia, the result of errors of diet, can be excluded. Emaciation is one of the most constant accompaniments of severe cases of hypersecretion and is often very difficult to combat.

Diagnosis of hypersecretion.

This will rest entirely upon finding fluid containing hydrochloric acid in the fasting stomach. The normal stomach may occasionally contain a few c.c., but anything over 30 c.c. will indicate hypersecretion.

The following are examples of this affection :—

B. W., *æt.* thirty-seven. Has been troubled with pain in the stomach and acid risings for two years. Fasting stomach contains 60 c.c. of clear fluid, showing total acidity 60, free HCl 50. An hour after Ewald's test breakfast total acidity is 90, free HCl 54. Six hours after a mixed meal stomach is empty. *Diagnosis:* Hypersecretion. No motor insufficiency.

H. R., a tailor, *æt.* twenty-four, came to my clinic in December, 1904. The patient has had indigestion for several months, the symptoms consisting of fulness after meals, pain, and acid rising. Has lost a good deal of weight. On inflation the lesser curvature of the stomach can be made out two inches below the xiphoid and the lower border of the stomach just below the umbilicus. One hour after an Ewald test meal 150 c.c. were extracted containing free HCl 60 and showing a total acidity of 90. Stomach is empty six hours after a mixed meal. Fasting stomach contains 100 c.c. of clear yellowish liquid giving total acidity 60, free HCl 40. *Diagnosis:* Gastroptosis. Hypersecretion.

Hypersecretion is frequently complicated by motor insufficiency or dilatation, which then tends to perpetuate the condition by the irritation of the retained food residues.

Treatment of Hypersecretion.

The main points in the treatment are the same as in hyperchlorhydria, with the exceptions that in severe cases rest in bed is essential and that lavage is usually necessary.

With very slight cases of hypersecretion much may be done by simple lavage in the morning. By this means we shall wash away the acid contents of the stomach and allow it to, so to speak, start fair with its day's work. With cases of greater severity the patient should be put to bed at once and a few weeks devoted to treatment which should proceed upon the following lines:—

1. A period of absolute abstinence from all food given by the mouth. During this time the patient is fed by nutrient enemata, and every day the stomach is washed out with a weak alkaline solution.

2. A second period during which the patient is fed through a stomach tube in addition to the nutrient enemata. The object of this procedure is of course to avoid exciting the secretion of gastric juice by the taste or smell of the food. One of the best food materials for this purpose, which has been especially advocated by Mathieu, is warm milk containing meat powder stirred up in it.

3. A third period during which the patient is advanced through a graduated scale of food preparations, commencing with liquids and passing through thickened vegetable soups, gruels, panadas, etc., until he finally reaches the solid diet given in hyperchlorhydria. (The reader is referred to the Appendix for particulars as regards these foods and their preparation.)

Morning alkaline lavage should be continued for some weeks after the solid diet has been reached. After that, a few applications of the intragastric spray of nitrate of silver will probably be required to complete the cure.

CHRONIC INTERSTITIAL GASTRITIS.

This condition, which is not unfrequently the result of long-continued irritation, is characterized by diminution of the amount of hydrochloric acid and pepsin in the gastric secretion with a large outpouring of mucus. It is often very difficult to determine the length of time during which the patient has suffered, as the commencement of the disease is usually slow and insidious. Whilst at the commencement there is probably only a mere disorder of function, later on there is certainly interstitial proliferation of cells in the mucosa, and the affection must then at any rate be considered an anatomical disease.

Symptoms of chronic interstitial gastritis.

At the beginning of the disorder these may be slight and hardly be noticed by the patient, who will probably experience merely some slight loss of appetite, belching of wind, and a feeling of pressure over the region of the stomach after food. As the disease slowly progresses the symptoms will increase in severity, and the patient will wake unrefreshed, often with a bad taste in the mouth. The sense of taste will often be perverted, and the patient will complain that articles of food taste "pappy". The actual dyspeptic symptoms will now be more severe, and consist of weight and fulness rather than actual pain, flatulence, heartburn, and certain nervous symptoms. The important points to notice are that the symptoms occur at the height of digestion, and vary in direct ratio with the indigestibility of the food. Whilst in nervous indigestion the kind of food consumed by the patient does not appear to make much difference to the suffering experienced, in chronic gastric catarrh a bland unirritating diet may be taken with impunity whilst a mixed meal of ordinary indigestible things will be at once followed by discomfort.

Another point is that although there may be a considerable craving for food, the appetite is very quickly satisfied and the patient feels that he has had enough almost before he has commenced the meal. The heartburn which sometimes annoys the sufferer differs from that observed in hyperchlorhydria in being caused not by hydrochloric acid, but by fermentation products and peptones. Nausea is sometimes present during the digestive period, but is rarely severe. When the gastric catarrh is the result of chronic alcoholism there is often nausea and retching in the morning before breakfast, sometimes terminating in actual vomiting. The vomit in such cases consists of mucus from the stomach, mixed with saliva and pharyngeal mucus which has been swallowed during the night.

The nervous symptoms associated with chronic gastric catarrh are usually drowsiness after meals, swimming in the head, often associated with a feeling of emptiness in the head and occasionally with nausea.

Diagnosis of chronic interstitial gastritis.

The clinical picture presented by primary chronic gastritis is not at all distinctive, and the absolute diagnosis can hardly be made with certainty without the employment of intragastric methods. It is a slowly progressive indigestion, not particularly painful, the symptoms being chiefly epigastric uneasiness, flatulence, and heartburn. To these must be added in many cases nausea and retching before breakfast. The main diagnostic points upon which we depend are, excess of mucus in the stomach contents after a test meal associated with diminution in the amount of hydrochloric acid and ferments, and the absence of food residues in the fasting stomach. When occurring as a complication in diseases of the stomach presenting the same symptoms, of which there are several, its recognition will depend of course solely upon the presence of these physical signs.

Treatment of chronic interstitial gastritis.

In the treatment of this affection the management of the diet plays a very important rôle, and is therefore deserving of serious study.

Diet.—As in the treatment of the other forms of chronic gastritis, one of the first considerations is to cut off all articles of diet which are capable of irritating the stomach; but as Boardman Reed has pointed out, the necessity of doing this is not so great as in cases of proliferative gastritis, owing to the fact that condiments in moderation are useful to stimulate the secretion of gastric juice, which is reduced in this disorder. It is important to bear in mind that no routine method of dieting is admissible, and that the food for each individual patient must be carefully prescribed with reference to the composition of his gastric juice as ascertained by actual examination, and to the amount of each particular kind of food which passes undigested through his alimentary canal.

Another important point is to remember that the flavour and smell of food are powerful factors in exciting the secretion of the gastric juice. We should whilst selecting articles of diet which are unirritating and easy of digestion prepare them in such a manner as to develop the natural flavour as much as possible, or even to add to it by the artifices of the kitchen.

The look of the food should also not be neglected. We know that merely the sight of food will provoke a copious flow of saliva and gastric juice in a hungry dog, and we have no reason to suppose that the same phenomenon does not take place in ourselves. In short, we must invoke the senses of sight, smell, and taste to assist us to rouse the dormant digestive functions by setting before the patient his food delicately cooked and daintily served and composed of material of the best obtainable quality. This subject

will be further developed in the Appendix, to which the reader is referred.

In an ordinary case some such diet as the following may be prescribed:—

Breakfast.—A basin of bread and milk, or a cup of cocoatina, a little boiled fish, or a poached or lightly boiled egg, and a slice of thin dry toast.

Lunch.—The lean of a mutton chop, a grilled sole, or a pigeon. One or two slices of toast or stale bread. A glass of milk and soda-water, or a little weak spirit and water (one tablespoonful to a small tumbler of cold boiled water).

Dinner.—One or two tablespoonsful of strong clear soup. Boiled or grilled white fish. Boiled, roast, or grilled fresh meat, or stewed pigeon. Two tablespoonsful of purée of green vegetables, or the same quantity of purée of potatoes. A little stewed fruit or a milk pudding. A little weak spirit and water as at lunch, or a single glass of any light wine or a glass of sparkling water.

It is of the utmost importance to insist upon three meals a day, and no more, and these at intervals of five or six hours. Nothing whatever is to be taken between meals. The object of the soup at the commencement of the chief meal is of course to excite the flow of gastric juice. In these cases the sense of taste is often defective, so that the exciting gastric juice will be in defect; moreover the diseased gastric mucous membrane will not be so readily stimulated to secrete by food introduced into the stomach. We must therefore try and supplement the deficiency in the natural excitation by the use of a solution of the extractives of meat, which Pawlow has shown us to be the most powerful agent which we possess for that purpose.

On rising in the morning a tumbler of hot water should be slowly sipped whilst dressing. This will wash away any mucus which may have accumulated during the night and

will materially increase the appetite for breakfast. This toilet of the stomach is most important and puts the organ into the best possible condition for undertaking the digestive duties of the coming day. If there is any tendency to morning sickness the water must be taken in bed before rising, with the addition to it of half a teaspoonful of bicarbonate of soda. It is important to make the patient understand that the water is not to be drunk off at a gulp, but to be slowly sipped, and that it must be as hot as can be taken with comfort.

If there is any tendency to constipation, a teaspoonful of Carlsbad salt may be added to the water, and may be taken as many times a week as may be necessary to secure a daily evacuation.

In cases where the gastric disorder is due to the abuse of alcohol, the first thing to do of course is to prohibit it in any form, or if this is impracticable, to cut it down to a minimum. The following may be taken as examples of suitable diets to be used in cases of alcoholic dyspepsia.

In slight cases the diet which I am in the habit of prescribing is somewhat as follows, modified of course to suit the particular patient:—

A tumbler of hot water to be sipped on rising.

Breakfast.—A little grilled fish or bacon, a lightly boiled egg. Dry toast, weak tea, or thin cocoatina, or Savory and Moore's peptonized cocoa and milk.

Lunch at 1 p.m.—The lean of a mutton chop, or a slice from a roast joint of beef, mutton, or lamb, or a little chicken or game. Purée of lettuce, endive, or spinach (*vide* Appendix). A little well-mashed potato. Dry toast or stale bread. One tablespoonful of whisky in a tumbler of sparkling water, or a glass of milk and lime water.

4 p.m.—A cup of weak tea and a biscuit.

Dinner at 7 p.m.—The same as lunch, with the addition of a little stewed fruit or a milk pudding.

In more severe cases:—

Breakfast at 8 a.m.—A basin of soup or a cup of beef tea or chicken broth. A piece of toast or bread.

At 10.30.—A cup of peptonized milk or gruel.

Dinner at 1 p.m.—The lean of a mutton chop, or a slice of underdone roast mutton passed through a mincing machine and warmed up with a little gravy from the meat. Dry toast. A tumbler of milk and soda-water. At this meal a few oysters may be allowed

4.30.—A cup of weak tea and a little toast.

Supper at 7.—A basin of soup or mutton broth, with a rusk or a little toast.

10.30.—A glass of hot water.

Medicinal treatment of chronic gastritis.

There are several indications for treatment in chronic gastritis. Unfortunately these cannot be entirely met by the use of drugs, and we have to call to our aid certain physical methods, such as lavage, electricity, and the use of the intragastric spray.

The purposes which we may desire to effect in cases under treatment are:—

To excite the secretion of gastric juice.—For this we rely mainly upon the exhibition of bitter drugs, such as gentian, rhubarb, centaury, hydrastis, nux vomica, or condurango. Lately orexin has been used with good results. Boardman Reed especially recommends the use of hydrochloric acid and pepsin given upon an empty stomach. I have used with success the constant galvanic current, both percutaneously and by means of an intragastric electrode.

To remove mucus from the surface of the gastric mucosa.—Much may be done in this direction by the administration of hot water, containing in solution either bicarbonate of soda, common salt, or Carlsbad salt. The desired effect is, however, much more efficiently obtained by lavage with

weak alkaline solutions. The administration of pepsin or papain undoubtedly removes mucus when given upon an empty stomach, and I think this fact may account for the good results and undoubted relief of symptoms obtained by these agents in many cases.

To check the secretion of mucus.—I think that the most efficient agent which we possess for effecting this is nitrate of silver. This is preferably made use of in the form of the intragastric spray after a preliminary removal of the mucus by lavage. It may, however, be given in capsules or solution, as already mentioned.

To check abnormal fermentation in the stomach.—There are several medicinal agents which may be used for this purpose, notably bismuth, resorcin, orphol, and the peroxide of magnesium. Systematic lavage, however, remains our most reliable method of keeping in check abnormal fermentation in the stomach. The discussion of this subject will be reserved until we come to the treatment of dilatation of the stomach.

To relieve pain.—To fulfil this indication we make use of sedatives, such as opium, cocaine, chloral, menthol, and hydrocyanic acid, either alone or in combination with alkalies.

Besides the systematic treatment of the gastritis, there will probably be some subsidiary troubles which may require special remedies.

Among these we may mention unusual anorexia, constipation, vomiting, or extreme flatulence. The treatment of these must be conducted on general principles, meeting the special indications with the known resources which we possess.

It is in the course of chronic catarrh of the stomach that a course of purgative mineral waters taken at a foreign spa has been found to give such striking results. It has often been pointed out that there is nothing magical in the locality

where the spring is situated. It is the strict diet imposed upon the patients, the regular exercise in the open air, and the systematic method of administering the waters which are responsible for the results obtained. And we do not sufficiently realize that nearly all the benefits which are to be obtained by a stay at Kissingen or Carlsbad can be procured at home at a much less cost by a careful and scientific administration of imported waters.

To produce these valuable results all we have to do is to imitate as closely as possible the essential conditions under which the waters are taken at the foreign watering place. You must insist upon a sufficient amount of fresh air and exercise, and a diet containing the minimum of saccharine and fatty matters, and absence of worry and business cares to as great extent as possible.

But as a little concrete teaching is always worth more than a much larger amount of purely abstract consideration, we will take a supposititious case of a City man who is suffering from lithæmia, or, as he would call it, "torpor of the liver", associated with chronic gastritis, and see what one day of his life would be, supposing that we were giving him a six weeks' course in imitation of that at Carlsbad.

He should rise at seven o'clock, and after having well rubbed himself down with a towel wrung out in warm water, finish off with brisk friction with a dry flesh-glove. Then after a ten minutes' spell with light dumb-bells or the pulley-weights, he should proceed to dress leisurely. Whilst he is doing so he will drink by sips a tumbler of hot Carlsbad water, containing as much of a stronger purgative water as he has found by experiment to be required to produce a single action of the bowels. By Carlsbad water I mean that imported in glass bottles, which has not the purgative action of the so-called *Carlsbad salts*. Perhaps the Carlsbad alone will be enough. The water is brought to the required

temperature by standing the vessel containing it in a basin of hot water.

After this a gentle walk of half an hour or so, and breakfast about 8.30. For this meal he may take a little white fish or an egg, cold meat or game, dry toast *with very little butter*—but if he can be induced to forego the latter it will be better; weak tea or Schweitzer's cocoatina, sweetened with one of any reliable make of saccharin tabloids.

Lunch should consist of little more than a lean mutton chop or steak, with green vegetables, stale bread, and mashed potatoes. A little sound hock or table claret may be taken, or a little weak, well-diluted spirit.

Finishing his business not later than four or five o'clock, he should take exercise for at least an hour or an hour and a half in the open air, gently walking or riding, and dine about seven.

For dinner a clear soup, grilled or boiled fish, roast or boiled meat; plain boiled green vegetables; stewed fruit, sweetened with saccharin; drink, the same as lunch.

The essential points in diet are: To avoid almost entirely fat, sugar, and the stronger forms of alcohol, and to leave off eating *before the appetite is quite satisfied.*

After dinner, gentle recreation in the open air or a game of billiards.

Retire to rest early, after ten minutes at the dumb-bells or pulley-weights.

In my experience I have found that, from a course of treatment carried out in this manner, the patient will derive almost as much benefit as if he had gone to Carlsbad or Kissingen.

There is no doubt that we are enabled, by a prolonged and carefully regulated course of purgative waters, to exert a profound curative and alterative action upon the system.

In certain cases of chronic catarrh of the stomach, I have frequently found the greatest benefit to follow a rather un-

orthodox procedure. It is to let the midday meal consist *entirely* of fresh ripe fruit. Whilst fruit eaten with other articles of diet at a mixed meal will often disagree, yet taken in this manner, I have found it tolerated to a surprising extent, and with marked improvement in the general condition of the patient. It interposes, as it were, a barrier between the two fermentable farinaceous and albuminous meals, and enables the stomach to get rid of all unhealthy mucus and abnormal ferments. But no bread or anything at all except the fruit must be taken. The acidity of the fruit appears to act as a direct tonic to the stomach, and the acid salts supply a systemic want, as dyspeptics of this class are rarely able to take sufficient vegetables.

CHAPTER IV.

ATONY OF THE STOMACH, OR GASTRIC MYASTHENIA.—DILATATION OF THE STOMACH.

MUSCULAR weakness of the stomach, or gastric myasthenia although usually unrecognized by the practitioner, is undoubtedly one of the commonest causes of dyspepsia. When it was first found possible to extract the contents of the stomach and to test the quantity and composition of the gastric secretion, it was thought that we had at last obtained a key to the diagnosis and treatment of the different disorders of digestion. Later experience has shown this hope to be fallacious, and it has now been established beyond the possibility of contradiction that abnormalities in the motor power of the stomach play a far more important rôle in the production of those affections which are accompanied by the collection of symptoms which for convenience we term "dyspepsia"

If the motility of the stomach be normal, and if it is able to empty itself at the proper time into the duodenum, considerable variations in the composition of the gastric juice may produce no symptoms whatever. The stomach, *bien entendu*, not being ulcerated, inflamed, nor abnormally sensitive, and marked hyperchlorhydria being excluded. Thus we may have gastric juice absolutely innocent of hydrochloric acid or pepsin, and no symptoms will be produced as long as the stomach can discharge the food into

the duodenum before fermentation has taken place. Conversely, no matter how normal the gastric juice, if the stomach be unable to completely empty itself before the breakfast of the following day, stagnation and fermentation of the retained food residues will take place, and the patient will suffer severely.

For whilst undoubtedly deficiency of acid and pepsin will slow digestion and possibly cause the food to remain longer than it should in the stomach, this will as a general rule only happen in cases where there is at the same time some muscular weakness. And in a large number of cases of so-called atonic dyspepsia the trouble is mainly one of motility, the gastric juice being approximately normal.

This fact—that the work of the stomach is mainly that of preparing the food for more complete digestion in the intestine—was pointed out as far back as 1894 by Fleiner[1] and Bourgetans,[2] and is completely established by instances of the restoration to practically perfect health of subjects who have undergone complete excision of the stomach. There is really far greater analogy between the stomach of a man and the gizzard of a bird than would appear at first sight. Both organs are muscular, and both triturate and disintegrate the food with the help of certain secretions, and, when properly prepared, pass it onwards into the next portion of the alimentary canal. The older views, as to the dependence of the symptoms of the so-called atonic dyspepsia, mainly upon deficiency of acid and pepsin in the gastric juice, may therefore be taken to be far from accurate. Such being the case, it behoves us as rational practitioners of medicine to revise our methods; and if we would really relieve our cases of dyspepsia, devote very serious study to muscular weakness of the stomach wall.

[1] *Sammlung klin Vortrage,* No 103, 1894
[2] *Wien. med Blatter,* No 45, 1894

Causes of gastric myasthenia.

In making a systematic study of gastric myasthenia the first point to which we must direct our attention is its causation.

Myasthenia of the stomach may be congenital. It may result from continual over-distension, from pyloric obstruction, from defective nutrition of the stomach wall, from disease of the stomach wall, from chronic congestion of the stomach. It may bear some relationship to neurasthenia, either as cause or effect or both, and it may be a sign of degeneration of the digestive system as a whole.

It will be instructive to study these several causes.

A. Congenital atony of the stomach.

Some unfortunate individuals are born with an abnormally small amount of muscular tissue in the walls of the gastro-intestinal canal, and in consequence suffer from constipation and indigestion from early childhood. Whilst such is undoubtedly the fact, I am convinced that many cases which at first sight appear to be congenital are really induced in babyhood by improper feeding on the part of ignorant and careless mothers.

Quoting from Soltau Fenwick's masterly treatise,[1] the average capacity of the stomach of a baby will vary as follows:—

Age of Infant.	Capacity of Stomach in oz
1 month	2·5
3 months	4·5
6 months	5·9
8 months	7·66
14 months	8·9

It is therefore obvious that at no one feeding should the infant be allowed to take a larger amount than the capacity of its stomach, and that the dose should be carefully measured

[1] *Disorders of Digestion in Infancy and Childhood* London, 1897.

according to its age. As a matter of fact, the greatest carelessness prevails and the child is given a bottle containing food of several times the amount of its stomach capacity and allowed to drink as much as it likes. Under these circumstances it appears almost a miracle that so many hand-fed children grow up with normal stomachs.

B. Atony the result of habitual over-distension of the stomach.—It is easy to understand the process by which over-distension of the stomach will produce atony and subsequent dilatation. If you forcibly pump fluid or air into a rubber ball you will find that after a certain degree of distension the elasticity will be diminished and it will have lost the power of regaining its original size. In the case of the stomach the result will be very much the same, and loss of contractility will inevitably result from long-continued ill-treatment, although the precise method by which this comes to pass is not quite as simple as in the case of the rubber ball. There will be three main factors at work in producing atony of the stomach—

1. The force required to empty a flexible hollow vessel against a resistance varies in proportion to the surface area of its interior. The greater the cubic contents of the stomach, the greater force it must exert to expel them. But the muscular power of the stomach remains the same. Consequently the more the stomach is distended the greater difficulty it must have in emptying itself.

2. Long-continued distension of the stomach compresses the vessels passing in the substance of its walls and thus diminishes the blood supply of the muscular substance. The result will be impaired nutrition and consequent weakness.

3. The distended stomach will gravitate downwards, and by kinking the pylorus offer a mechanical obstacle to its emptying itself.

We can thus readily understand why atony of the stomach

is so frequently met with among those who drink beer and tea to excess, and among those who eat in haste without proper mastication. Constant use of hot beverages appears to be especially prone to weaken the muscular walls of the stomach, the heat itself tending towards muscular relaxation. The habit in which some people indulge of taking quantities of hot water at intervals during the day must tend to produce atony of the stomach, and I have frequently met with cases among patients who have been attempting to treat themselves for what they had diagnosed as "dyspepsia" by means of the so-called Salisbury treatment.

C. Progressive pyloric stenosis.—The mechanism by which pyloric stenosis eventually produces gastric myasthenia is of great interest, and exhibits the same phenomenon of muscular compensation to overcome an obstruction, with eventual breakdown of the artificial condition of equilibrium, so familiar to us in cardiac disease. As in heart affections there will be two distinct stages.

1. As the result of the narrowing of the pylorus the stomach encounters a certain amount of difficulty in emptying itself through the pylorus, and adapts itself to the increased work by hypertrophy of its muscular layer.

2. The pyloric obstruction being usually progressive, a time comes sooner or later when the muscular walls of the stomach, although hypertrophied, will be unable to pass the food through the pylorus before the next meal.

Food will then be retained in the stomach, will gradually accumulate until distension takes place, and atony will be produced in the manner described.

D. Defect in the nutrition of the stomach wall.

This condition is most commonly met with in states of general malnutrition such as accompany convalescence from acute diseases. When recovering from typhoid or influenza the muscles of the stomach are participating in the general weakness, and the incautious administration of a single large

meal may induce an atonic dilatation which may be very difficult to cure. From this fact the important lesson is learnt that in all convalescence from acute illnesses we are acting wisely in restraining the appetite of the patient and in only allowing him to resume the ordinary mixed diet of health by very gradual steps. In wasting diseases such as phthisis, gastric atony is especially apt to be induced unless the greatest care be taken that the patient's food be either in a finely divided condition or very well masticated, and not in excessive quantity at any one meal. I am quite convinced that the practice which obtains at some of the modern sanatoriums for the open-air treatment of phthisis, of overfeeding the patients until they vomit, is unsound in theory and must inevitably lead to numerous cases of dilatation of the stomach.

E. Disease of the stomach walls.

The most frequent affection of the stomach wall to produce myasthenia is chronic gastritis. In this case the weakness of the muscular substance of the stomach is induced by direct extension of the inflammatory process in much the same way as that of the myocardium in pericarditis, the superficial layers of the muscle immediately underlying the gastric mucosa showing evidence of fatty and granular change. Atony of the stomach is also frequently met with in malignant disease of the stomach, and is due either to infiltration of the stomach wall with the cancerous elements or to the interstitial chronic gastritis which is such an invariable accompaniment of this affection.

F. Chronic passive congestion of the stomach.—This is of frequent occurrence in cardiac or hepatic disease, the retarded circulation through the stomach inducing weakness in its muscular layer attended by varying degrees of motor insufficiency. And this condition not unfrequently occurring before the cardiac or hepatic affection is sufficiently advanced to produce characteristic symptoms, we can see how neces-

sary it is to make a thorough examination of heart and liver as a routine procedure in all cases before deciding that the gastric trouble is a primary affection.

G. In relation to neurasthenia.

When we meet with the marked symptom-complex of neurasthenia in association with atony of the stomach, we have to determine whether the atony is a symptom of the neurasthenia, whether the neurasthenia has been caused by the atony, or whether they are both concomitant, having possibly a common origin.

In many cases the atony is one of the ordinary characteristic fatigue symptoms of the neurasthenia, happening in this instance to manifest itself in the stomach. It is to these cases that the term gastric myasthenia should properly be restricted, although for convenience it is generally used to express muscular weakness from any cause. Very often the atony is not the result of the neurasthenia but its cause, the nervous condition being the immediate result of the malnutrition induced by it and by the continual poisoning by toxines produced in the stomach and intestines. In these cases a vicious circle is established and the neurasthenia in its turn perpetuates the gastric condition.

We must always be on the alert for this state of things, and not jump to the conclusion that an atonic stomach spells gastric neurasthenia because it happens to occur in a neurasthenic subject.

On the other hand, neurasthenia is often overlooked, firstly, because the patient usually lays most stress upon his gastric symptoms and omits to mention the other fatigue symptoms—the lessened capacity for work and the loss of the power of mental concentration—except under cross-examination. Secondly, because many people have atony of the stomach as the sole symptom of their neurasthenia. The digestive organs in these patients, owing to some natural weakness, give way first as the point of least

resistance, and the earliest symptoms of neurasthenia are in the stomach. We have atony as the result of a general nerve weakness with a special determination to the ganglia presiding over the digestive organs.

In neurasthenics temporary attacks of gastric myasthenia often occur in periods of mental depression or anxiety. The duration of such attacks is from a few hours to several days. The probable explanation is some temporary loss of excitability of the ganglionic centres supplying the alimentary tract.

As a general rule neurasthenia only causes atony of the first degree.

H. A degeneration or breaking down of the digestive system as a whole.

After the human body has reached its full growth, a period of equilibrium ensues during which the mental and bodily powers reach their highest level. At the termination of this portion of the life history of the individual degeneration commences, as a rule not affecting the body equally in all its parts, but manifesting itself first in one particular tissue or organ. In many persons from some inherent weakness the retrograde processes commence in the digestive organs and manifest themselves mainly in the direction of myasthenia. It is in these patients that we meet with gastroptosis, enteroptosis, nephroptosis, and in extreme cases the distressing symptom-complex known as the *maladie de Glénard* in its most typical form. In slighter cases we usually find varying degrees of gastric myasthenia associated with obstinate constipation.

The nature of atony of the stomach or gastric myasthenia.

Gastric atony is essentially a local weakness of the muscular walls of the stomach. An organ thus affected cannot support the weight of a normal meal without stretch-

ing, and is always unable to contract efficiently upon its contents.

For clinical purposes it is convenient to recognize three degrees of myasthenia or gastric atony:—

First degree.—The stomach can empty itself at the proper time, but has lost its tonicity and cannot contract efficiently upon its contents. In this stage there is no retention of food.

Second degree.—The stomach cannot completely empty itself in six hours, that is to say, before the next meal comes due, but manages to do so during the long interval between the evening meal and breakfast the next morning. There is thus partial retention of food.

Third degree.—The stomach can never completely empty itself, but always contains food residues from previous meals. There is thus said to be complete retention of food.

Of course the affection does not pass abruptly from one stage to the other. There is, for instance, usually a transitional period between the second and third degree, in which the stomach manages to empty itself occasionally.

We will now study the symptoms attending the evolution of gastric myasthenia.

Symptoms of the first stage of gastric myasthenia.

In this stage there is simple loss of contractility, and the stomach whilst able under favourable circumstances to empty itself before the next meal frequently cannot expel the gas which forms in it, which will in consequence distend its cavity. As there is no fermentation the symptoms are not distinctive; in fact in many cases the patient does not complain of his stomach. But if cross-examined it will be usually found that the patient experiences more or less fulness after food, eructation of gas, and very often some nervous symptom such as inability to sustain prolonged mental or bodily exertion. As regards the sensation of

fulness after food, one must be careful not to confound this with the distension and oppression in the lower abdomen so common in cases where starch is not properly digested in the intestines.

Many cases of gastric myasthenia in the first stage are absolutely devoid of symptoms, and this has given rise to the fallacy expressed in several of the most recent text-books upon diseases of the stomach that the splashing sound was not a reliable sign of gastric myasthenia. This subject will be again referred to later on.

We may consider the subject of gastric myasthenia to be in the first stage as long as the stomach is able to empty itself before the next meal. That is to say, within six hours. But as the disease progresses, sooner or later the time arrives when the stomach is only just able to do this. But this condition of unstable equilibrium may be upset by any temporary exhaustion from overwork or worry or other exhausting cause, the next meal being in consequence received into a stomach temporarily unable to empty itself and containing food residues. An attack of "indigestion" is the result. The atony has for the time being passed into the second stage. These attacks of temporary gastric insufficiency are often accompanied by faintness as in the following case:—

Mr. H., a youth about seventeen years of age, very neurotic and with a neurotic family history, overworked himself for an examination. The day after the examination was finished he complained of faintness, and this sensation continued all day. The next morning at breakfast he lost consciousness, vomited and brought up practically the whole of the food which he had eaten on the previous day. He made a good recovery for the time, but later on in life developed myasthenia of the second and third degrees.

As a rule in all these cases a few days of partial abstinence from food will suffice to restore the equilibrium, but with

recurring attacks a time will inevitably come when on one occasion such a happy result does not follow, and from this date residues are to be found in the stomach six hours after meals,—at first only occasionally, a little later invariably. The disease has now passed into the second stage.

In the first stage the patient very often does not recognize that he has anything the matter with his stomach, as his headache, migraine, or other reflex trouble has no time relation to food and does not suggest dyspepsia. As a general rule it is not until the patient enters the second stage that he begins to think at all seriously of his trouble.

The symptoms of the second stage of gastric myasthenia are apt to supervene suddenly, and are often induced by a mental shock or an excessive meal. The patient is thus apt to ascribe the onset of his complaint to a Masonic banquet or public dinner at which he exceeded the dictates of prudence. Patients who are in the latent period will often tell you that after such a large dinner they have an attack of acute indigestion during the night. The slightly myasthenic stomach, although still well able to handle an ordinary meal, is yet unfitted to deal effectively with one of unusual bulk. But to a myasthenic stomach such a large meal may be the last straw, and the stretching which the stomach has undergone may not be recovered from and the stomach remain permanently crippled. Such a patient will retire to bed feeling extremely comfortable. He has had the ordinary public dinner which many men can take several times a week with impunity. He has had, perhaps, various assorted *hors-d'œuvres*, soup, whitebait, another fish, two entrées, the inevitable saddle of mutton, bird, and salad and sweets. He has taken about half a bottle of champagne, a coffee, a liqueur, and afterwards a whisky and soda, and has smoked a couple of cigars. He considers that he has been most moderate because he has taken no iced pudding, no fruit, and has not mixed his wines. He retires to bed and

falls off to sleep. Now a normal stomach would, even if unable to completely digest such a meal, empty itself in a few hours into the duodenum, and thus shift the onus of disposing of it upon the intestine, perhaps with the result of a little diarrhœa. The myasthenic stomach, however, cannot cope with it as it is too heavily handicapped. The patient will shortly wake with nausea and a sense of discomfort in the region of the stomach. As we have seen (*vide* Acute Indigestion), the temperature is often slightly raised, and there may be trembling or jactitation of the limbs, or a feeling of soreness or chilliness over the body, and in some cases I have seen distinct rigors. Usually vomiting speedily occurs, and the patient drops off to sleep much relieved.

Symptoms of the second stage of gastric myasthenia.

The stomach cannot now empty itself in six hours, but does so during the night, and thus enjoys a short rest before breakfast. This stage has been termed the stagnation form, because the food has time to stagnate and sometimes ferment before it reaches the duodenum.

The amount of fermentation which actually occurs will depend partly upon the fermentable character of the food and partly upon the condition of the mouth. Septic stumps and pyorrhœa alveolaris are a fertile cause of gastric fermentation from infection by germs swallowed with the food.

It is needless to say that fermentative changes never take place to anything like the same extent as in the third degree, in which the stomach practically never empties itself without assistance, and there is in consequence permanent retention of food residues.

In addition to the symptoms belonging to the first stage already enumerated, viz. fulness after meals, eructations of gas, and inability to sustain any prolonged mental or bodily

exertion, the patient will now experience in addition the miseries arising from the stagnation and fermentation of food.

He may have a selection of one or more from the following long list of symptoms:—

A. Regurgitation of food having a bitter or acid taste.

B. Symptoms due to the absorption of toxines from the alimentary canal.

1. Loss of appetite, nausea, and vomiting.
2. Insomnia, headache, vertigo, mental depression, migraine.
3. Various paræsthesiæ, numbness, tingling, sensations of crawling.
4. Fibrillary twitchings and limited clonic contraction of muscles.
5. Slowness of the heart's action with perhaps reduplication of the second sound at the apex.
6. Certain skin eruptions, notably erythema and urticaria.
7. Anæmia.
8. Acute or chronic gout. As time goes on, more and more evidence accumulates to point to the fact that the gouty condition is due to intestinal dyspeptic processes.

C. Intestinal symptoms, of which the most important are—

1. Muco-membranous colitis.
2. Intestinal indigestion.

As long as the intestines remain normal, it is possible for the greater part of the digestive process to take place there, and the patient may retain his nitrogenous equilibrium. When this is no longer the case the patient is within a measurable distance of progressive emaciation. It is obvious that in gastric myasthenia the intestines are exposed to special dangers from the large quantity of decomposing material which is continually being poured into them. As

already stated, the commonest intestinal trouble met with in these cases is muco-membranous colitis, and in cases of this affection the presence of gastric myasthenia should always be looked for as a possible cause.

D. Continuous hypersecretion. This is one of the most constant effects produced by gastric myasthenia of the second degree. The retention of food residues keeps up sufficient irritation to lead to a continual secretion of gastric juice.

The following graphic description of twenty-four hours of the life of a patient with atony of the stomach of the second degree is translated from Chaillou and MacAulliffe,[1] and is well worth quoting.

"The night very often restless, full of dreams or nightmares, and interrupted by waking at a fixed hour during the second half. On waking in the morning the patient frequently experiences a sensation of acute pain in the lumbar region and a bruised feeling at the level of the last ribs in the right or left half of the thorax. The tongue is coated and there is no appetite. The morning is marked by inaptitude for mental work. The midday meal is waited for with impatience from as early as ten or eleven o'clock. The patient feels that 'he must take something,' he feels weak, his head empty, and he is altogether without spirit or animation. Very quickly satisfied, he rises from table swollen and blown out. He has a feeling of weight in the stomach, a sensation of uneasiness in the epigastrium, and feels as if his head were congested. At the end of about an hour all these phenomena gradually disappear and leave behind them a short period of comfort. Then after four or five hours the patient begins to bring up wind, the odour of which recalls the dishes which composed the midday meal. After this comes on a feeling of weakness, especially in the legs, and at the same time a sensation of emptiness and perhaps some

[1] *Précis d'Exploration Externe du Tube Digestif.* Maloine, Paris, 1903

flying pains either at the pit of the stomach, the kidneys, or the abdomen. Sometimes there is severe cramp in the stomach, that is to say, a sensation of twisting above the navel or a feeling of constriction of the whole abdomen at this level.

"These painful symptoms are always more marked on days when the midday meal is more copious than usual. On the other hand, the feelings of weakness and emptiness are always worse on the days when the meals have been light.

"The evening meal usually causes most of the disagreeable sensations to disappear, and the period following it is the best time of the day. The patient, knowing that a large evening meal is invariably followed by an uncomfortable night, eats very little at this meal, and consequently feels much better after it. As regards the bowels, these are only open every day as the result of medicines or injections. Left to themselves they are irregular, the motions being sometimes hard, sometimes soft, always small in amount, and often bloodstained from the presence of piles."

The passage from the second to the third stage is sometimes quite sudden. Imprudence in food, over-fatigue, or influenza, or other depressing cause may supply the proverbial last straw. I have seen it apparently caused by the passage of a gall-stone.

But in most cases the passage from the second to the third stage, like that from the first to the second, is gradual. The patient will have at intervals a succession of attacks during which compensation fails, and the stomach on this occasion does not succeed in emptying itself during the night. Vomiting occurs, the patient takes to his bed and is put upon a restricted diet for a few days, equilibrium is re-established, and the stomach resumes the *status quo* of myasthenia of the second degree. As the affection progresses the attacks become more and more frequent, until finally the condition of gastric insufficiency becomes per-

manent and firmly established. The third stage has been reached.

Symptoms of the third stage of gastric myasthenia.

The stomach can now never empty itself completely of its contents and always contains a fermenting residue of food. It is ever in a septic condition, and fresh food will commence to ferment almost as soon as it has been introduced into it.

In addition to the symptoms of myasthenia already described, which will naturally increase in intensity, the patient will now have additional troubles due to the following factors :—

1. The quantity of water which leaves the stomach and passes into the duodenum is much reduced. From this naturally follows thirst and constipation with diminution in the quantity of urine.

2. In the first and second stages of myasthenia, fermentation does not take place in the stomach to any serious extent. The chyme which passes from the stomach into the duodenum still contains nutritious substances and can be utilized for further digestion in the intestine. It is far different in retention myasthenia when well established. Not only is the peptonization in the stomach reduced to a minimum, but the stomach contents which actually reach the duodenum are disorganized, and are neither useful for nutrition nor for further digestive processes. We shall in consequence have as symptoms :—

(*a*) Emaciation of the patient from actual starvation.

(*b*) Various intestinal troubles, set up by the irritation of the putrefying mass which has been introduced into them through the pylorus.

There is certain to be intestinal flatulence and often localized pain. Diarrhœa is sometimes met with from the irritation of the intestinal contents and the fermentative processes going on in them. More often we find constipa-

tion, produced partly by the deficiency of water which reaches the intestine and partly by localized spasm of the large intestine. The condition of the patient is in this last case of considerable gravity, as the intestines not being able to empty themselves of their poisonous contents, toxines are absorbed into the system with the result of setting up neurasthenia of a severe type. Among the several intestinal troubles, mucous colitis is often met with as a very distressing complication.

(*c*) I believe that it will be found eventually that mucous colitis accompanying neurasthenia is not the neurosis which it is generally considered to be, but the direct result of an associated gastric myasthenia.

(*d*) The irritation of the fermenting food in the stomach will produce pain and nausea. As with successive meals the residual material in the stomach increases, a point at last will be reached when vomiting will occur. After it has once taken place, for a long time it will probably occur every fourth or fifth day. As the disease progresses it may become more frequent until it is practically continuous.

In this stage of myasthenia the most important point to bear in mind is that the patient is being gradually starved, since no food is able to be utilized for nutrition except that consumed during the few hours immediately following the act of vomiting.

Diagnosis of gastric myasthenia of the first and second degree.

It will be seen that, although interesting, the symptoms are not entirely characteristic, and of themselves will not enable us to make a diagnosis. The following three points are, however suggestive, and should lead us to suspect an atonic condition of the stomach:—

1. With the exception of belching of wind in uncomplicated cases, the symptoms only occur when there is food in

the stomach, and the distress varies directly with the amount of food taken. When the stomach is empty the patient feels perfectly well.

2. Liquids give rise to as much discomfort as solids; sometimes even more.

3. The patient is adequately nourished and maintains his metabolic equilibrium. But all these symptoms offer merely presumptive evidence, and to establish upon a sure foundation the nature of the case we must proceed to make a physical examination.

First of all, we must disabuse our minds of the idea that the estimation of the actual size of the stomach will help us to any considerable extent. Stomachs may vary in size the same as other organs of the body, and a large one may exceptionally be able to empty itself at the proper time, whilst an exceedingly small one may happen to be atonic and myasthenic. One finds in the text-books and monographs on diseases of the stomach many precise directions for making out the exact size of the stomach. In practice, one finds that without the assistance of inflation, diaphane, or other intragastric means it is exceedingly difficult; and this being the case it is a fortunate circumstance that such estimation is of so little practical value.

Unfortunately, considerable misconception still exists as regards the definition of dilatation of the stomach. We frequently find in published reports of cases such statements as the following: "The stomach was considerably dilated, the greater curvature being one inch below the umbilicus." The physician reporting the case has apparently arrived at his diagnosis from the size of the tympanic area of the stomach as mapped out by percussion. Incidentally he has failed to note the position of the lesser curvature, and consequently has not excluded gastroptosis, which might account for the position of the lower margin of the stomach. But putting aside the fallacies inherent to this method of attempt-

ing to ascertain the size of the stomach, and assuming that the information obtained by it was correct and that the stomach was really larger than normal, nothing whatever could be inferred from this unless the physician had on a previous occasion had an opportunity of examining this same stomach, and had on that occasion found it to be considerably smaller. For it is quite possible that it might always have been this size, and not be dilated at all; or it might be in a condition of compensatory hypertrophy. One cannot too forcibly insist that in order to justify a diagnosis of dilatation there must be some degree of muscular insufficiency in addition to a mere increase in size. For as long as a stomach is functionally competent and able to empty itself in the proper time, we cannot consider it dilated from a clinical point of view. *Dilatation means weakness plus enlargement.*

The most useful methods of physical examination at our disposal for estimating the size of the stomach, its situation, and the condition of its muscular coat are the following:—

1. Percussion and auscultatory percussion.—In the hands of the specialist who is constantly occupied in examining cases of gastric disorder these methods are extremely useful and give valuable information. When used by persons of merely ordinary skill and experience they are fallacious, and any information obtained by means of them requires to be checked and controlled by more certain methods. To illustrate this point, I have frequently directed a student at my clinic to make out the size and position of the stomach by percussion, and have then proceeded to demonstrate to him, either by inflation or by the use of the electro-diaphane, that the stomach was in quite a different situation. Before one can get useful information by percussion, it is necessary to make a very careful study of the different tones which are normally present in different parts of the abdomen under different conditions. And this is not at all easy, since the sound emitted on percussion differs in the first place for each

viscus, each having an inherent normal note, and again is modified by their temporary condition of fulness, emptiness, atony, or tonicity.

2. The splashing sound.—This sound can be produced by appropriate manipulation of the abdominal walls over the region of the stomach. It has been asserted that this symptom was of little significance as a diagnostic sign of myasthenia gastrica, because in many cases it could be elicited in individuals who had apparently absolutely no digestive troubles. The answer to this is the fact that symptoms are frequently absent in the first degree of atony of the stomach. For the production of the splashing sound it is necessary that the stomach should contain a mixture of gas and air. Theoretically, therefore, it should never occur in a really healthy stomach, which should always be in a state of contraction upon its contents. It must be borne in mind that the stomach is not a simple bag of a definite size, but a muscular organ whose internal capacity, when absolutely normal, is exactly that of the bulk of its contents. If you introduce a pint of water into the healthy stomach, its interior measures exactly a cubic pint, and there is no room for anything else. Any air which may be swallowed, or gas which may form in it, is immediately expelled. It follows, therefore, that theoretically no stomach in which splashing can be obtained can possibly be entirely healthy as to its musculature. Probably such a perfect stomach is very seldom met with at the present day, and we are therefore in the habit of saying that in a normal stomach splashing can usually be met with directly after a meal. We may, however, I think, assume that all splashing occurring later than one hour after a meal must indicate some degree of muscular weakness of the stomach, and patients in whom this physical sign is accidentally discovered should not neglect treatment, although they are not consciously suffering from any gastric trouble. In many cases the patient has become so accustomed to his slight

indigestion that he does not notice it, and will not complain about it unless cross-examined with reference to his sensations after meals. Numbers of patients in whom I have discovered gastric splashing during the digestive period, and who have assured me that they were not troubled with indigestion, have admitted, on close questioning, that they were conscious of a slight feeling of fulness during digestion, or frequently brought up wind, or were troubled with constipation. In many cases symptoms such as headache, migraine, or agoraphobia, not suggesting dyspepsia to the patient, but having a distinct time relation to food, and therefore obviously of gastric origin, have been overlooked.

In addition to its use in pointing out that a stomach is myasthenic, the production of the splashing sound in the stomach will tell us whether it has emptied itself or not. Thus if we find that the stomach splashes before breakfast we know that it must contain liquid of some kind, and that there must be either continuous hypersecretion or retention of food residues.

We can also in many cases map out the size of the stomach very accurately by noting the area over which the splash can be elicited. And we are able to do this in many cases in which percussion gives no definite information.

3. The production of splashing when two glasses of water are taken by the patient upon an empty stomach (that is, in a stomach which did not splash until the water was taken). —If the stomach is healthy, most usually no splashing can be elicited after the ingestion of sixteen ounces or so of water, as the stomach will contract tightly round its contents. Sometimes, however, it can be obtained under these conditions, but only for a few moments, as the stimulus of the examination will quickly cause contraction of the stomach to take place. The atonic stomach, on the other hand, sags down under the weight of the contained water, as in Dehio's test (see next paragraph), and does not completely empty

itself for at least two hours, during which period splashing can be obtained. This peculiar inability of the myasthenic stomach to dispose of liquids is quite characteristic, and may be demonstrated by the water test described in chapter vi.

4. Method of Penzoldt and Dehio.—This method depends upon the fact that if a person whose stomach is healthy drinks a couple of tumblers or so of water, the position of the dulness corresponding to the greater curvature will remain practically unchanged. A myasthenic stomach, on the other hand, will give way and stretch under the weight of the contained liquid, and the lower limit of the stomach will vary accordingly.

To perform this test half a glass of water is first of all drunk by the patient, and the lower margin of the stomach is made out as accurately as possible by percussion whilst the patient is in the upright position. This is marked with a dermographic pencil upon the skin of the abdomen. The patient then drinks about a pint of water in doses of half a tumblerful at a time, the lower margin of the stomach being percussed out between each. If the stomach be myasthenic this will be found to be distinctly lower after each draught.

5. Soda test for food residues.—We can often obtain useful information as to whether residues are present in the fasting stomach by administering to the patient a small quantity of a saturated solution of bicarbonate of soda. Any such residues will nearly always be acid in reaction either as the result of organic acids or from hypersecretion. Under such circumstances the alkali swallowed will effervesce, and this can be distinctly heard by auscultation of the abdominal wall. If effervescence takes place we can incidentally learn the position of the lower border of the stomach by moving the end of the stethoscope in a downward direction until we cease to hear the sound. This of course must be done

rapidly, as the effervescence only lasts for a very short time. The amount of acid in the stomach may be roughly gauged by seeing how many half-ounces of the soda solution we can give in succession before effervescence ceases to be produced.

6. Estimation of the position of the greater curvature by means of an effervescing powder.—This test is very similar to the foregoing, but can be used when the stomach contains no free acid. After giving a dose of bicarbonate of soda in solution, not exceeding ten grains, a like quantity of tartaric acid is taken. Effervescence will take place, and by auscultation the lower border of the stomach can be easily made out. These two tests are useful as routine procedures for checking the results obtained by percussion when we wish to avoid intragastric methods.

There remain two methods of estimating roughly the muscular sufficiency of the stomach which, whilst not strictly accurate in their results, are useful clinically in cases in which it is undesirable to pass a tube. These are the salol test and that by means of iodopin. Both these drugs are insoluble in the acid contents of the stomach, but when evacuated into the duodenum are split up into substances which are eliminated and can be recognized in the secretions of the body.

7. The salol test.—For the performance of this test advantage is taken of the fact that this drug, which is a phenol ether of salicylic acid, splits up into phenol and salicylic acid when it comes into contact with an alkali. The drug will therefore remain unchanged in the stomach, but the decomposition will take place as soon as it comes into contact with the alkaline contents of the duodenum.

The length of the interval between the ingestion of the drug and the finding of salicyluric acid in the urine will thus give us an idea of the time which elapses before any of the contents of the stomach commence to pass into the

duodenum, and consequently of its muscular efficiency. In order that we may ensure the acidity of the stomach we must give the drug at the height of digestion, that is to say, about three-quarters of an hour after an Ewald test breakfast or an hour after a mixed test meal. A capsule or cachet containing fifteen grains of salol is usually given and the urine examined seventy-five minutes later. If we cannot now obtain the reaction of salicyluric acid we may assume that the stomach is muscularly insufficient to some degree. Most of the objections which have been raised to this test are based upon the fact that under certain conditions the drug may undergo decomposition in the stomach and consequently appear in the urine at the normal time, notwithstanding the fact that the stomach does not properly empty itself. We eliminate this source of error by making our first examination at the extreme normal limit, since the cases with normal stomachs in which the excretion is delayed are very rare. But as a set off against both these sources of fallacy, we may make another examination of the urine at the end of twenty-seven hours, the time when normally it should cease to appear in the urine. It has been found clinically that in most cases of motor insufficiency of the stomach the length of time during which the acid continues to be eliminated from the urine is much increased, so that if we find that both the appearance is delayed and its elimination lasts longer than twenty-seven hours, we may assume with a reasonable degree of certainty that there is motor insufficiency. And this will be especially the case if we use the test in a rational manner to confirm the suspicions which have been aroused by the history of the case, the character of the symptoms, and the presence of splashing in the stomach at a period after meals when it should normally be empty.

The most practical method of testing the urine for salicyluric acid is to allow a small quantity to fall upon a piece of

white filter paper. This may be done by the patient at home, who can send or bring the dried slip for examination. Upon the centre of the filter paper place with a glass rod a drop of a ten per cent. solution of neutral ferric chloride. The edge of the drop of ferric chloride will assume a violet colour if the least trace of salicyluric acid be present.

8. The iodopin test.—This drug, like salol, is decomposed in the alkaline contents of the duodenum with the liberation of free iodine which is excreted in the saliva, in which it should appear within fifteen minutes of its ingestion if the stomach is functioning normally and expelling its contents through the pylorus as fast as they are digested. If iodine does not appear in the saliva in forty-five minutes we may assume that motor insufficiency is probably present. The method of performing the test is to give the patient fifteen drops of the iodopin made into an emulsion with a little gum and water. At the termination of thirty minutes we direct the patient to expectorate a little saliva into a porcelain evaporating dish, and to repeat this procedure into three or four similar dishes at intervals of fifteen minutes. We then test for iodine by adding into each dish a drop of starch solution which has been acidulated with strong nitric acid. The presence of iodine will be shown by the well-known blue colouration.

The chief sources of fallacy in this test are the presence of achylia or chronic gastritis, in which the contents of the stomach may be alkaline, and hyperchlorhydria, in which the acid is in excess. In the former the iodopin will be decomposed in the stomach, from which we know iodine is readily absorbed into the general circulation; and in the latter its decomposition will be delayed, as a longer time will elapse before neutralization of the hyperacid chyme can take place in the duodenum. We can to a great extent overcome these difficulties in the case of chronic gastritis by administering a dose of dilute hydrochloric acid at the same

time as the iodopin. In hyperchlorhydria muscular atony is not very common, and the symptoms are usually so characteristic as to enable us to discount the results which we obtain. In a case of ordinary severity we may reasonably be satisfied with these tests, as in actual practice it is not always either necessary or advisable to subject the patient to the inconvenience of intragastric methods. If the splashing is limited to the digestive period, is absent before breakfast, and no effervescence occurs when a dose of soda is taken, we may eliminate myasthenia of the third degree (retention myasthenia). If we find splashing and effervescence six hours and a half after a mixed meal, but absent before breakfast, we may diagnose myasthenia of the second degree. If the splashing is limited to the digestive period, any myasthenia present must be of the first degree and there is no retention or stagnation of food.

In the diagnosis of these conditions, as in many other affections met with in daily practice, we may be content with such a reasonable certainty and (unless the patient expressly wishes it) may abstain from the final absolute proof obtained by the passage of a tube.

But of course in doubtful cases, or in those in which the affection is obviously of a serious nature, we shall make use of the methods given in detail in chapter vi.

But when we have established the fact that the stomach does not empty itself in the normal time and we have demonstrated the presence of myasthenia, our work is not yet finished. Before we can proceed to treat the patient in a scientific manner we must also ascertain—

(*a*) The stage which the affection has reached: whether the atony is in the first, second, or third stage,

(*b*) Whether it is complicated by chronic gastritis,

(*c*) Whether there is continuous hypersecretion or not,

(*d*) The presence or absence of gastroptosis or enteroptosis, and

(*e*) We must work out the cause if possible.

Having answered these questions in a satisfactory manner, we may proceed to study the subject of treatment and seek to determine the line to be pursued in order that we may help our patient in the most satisfactory manner.

The treatment of gastric myasthenia covers an immense field, and can only be studied in anything like an approach to a satisfactory manner by dividing the subject into sections and taking them one by one. It is true that it is impossible in many cases to prevent these sections overlapping, but notwithstanding these disadvantages, it is the best that we can do in the present state of our knowledge.

The treatment of gastric myasthenia.

The indications for treatment will be the following :—

The removal of any obvious cause.—Common sense will tell us that this must be our first care, as if we allow a condition to be perpetuated which is at the root of the patient's trouble, all our efforts to alleviate his condition must be either futile or productive of only temporary benefit. A certain number of the slighter cases will recover quickly if we can find a cause and remove it without any special form of treatment directed to the stomach atony.

Among the causes of atony of the stomach which we are able to influence by appropriate measures we find the following :—

Errors in diet.—These have been already enumerated and will be further discussed in the next section.

Portal congestion resulting from cardiac or hepatic disease.—The treatment of these conditions is of course perfectly familiar to my readers and need not be enlarged upon.

The prevention of pyloric spasm.—In those cases of myasthenia directly caused by constantly recurring spasm of the pylorus associated with hyperchlorhydria, the treatment

of this latter condition is the most important point in the management of the disease. Until the spasms have ceased, no local treatment for restoring the muscular power to the stomach can do anything but harm. Hyperchlorhydria complicated with pyloric spasm and resulting gastric myasthenia becomes a serious disease, and the patient will be well advised if he makes up his mind to make a determined effort to relieve himself permanently of his trouble by going through a serious course of treatment. Such a plan would comprise first a period of rest in bed with rectal feeding, and lavage of the stomach with alkaline solutions, then a gradually improving scale of diet with the necessary physical measures to restore tone to the stomach.

The relief of gastroptosis by appropriate support.—Gastroptosis, as we have seen, may be the primary cause of gastric atony and dilatation by offering a mechanical obstacle to the proper passage of food through the duodenum, and when present it should receive our careful attention. But apart from gastroptosis, it is hardly possible to lay too much stress upon the value of proper abdominal support as a routine treatment of all cases of myasthenia gastric in its early stage. It is not going too far to say that we may by means of a properly fitting bandage or belt do much to check the affection and prevent it from arriving at its final stage of retention myasthenia. When the stomach is normal, the effect of the distension of its pyloric end by the food which is being propelled into it by the peristaltic movements is to cause it to rotate forwards and upwards, and thus to take the tension off the gastro-hepatic ligament. The result of this is that the pyloric flexure is straightened out and the passage of the chyme is greatly facilitated. But when the stomach becomes myasthenic this does not happen; no rotation takes place, but the pyloric end of the stomach sinks down under the weight of the contained food, and an angular stricture or kink is

produced at the first part of the duodenum which offers a material obstruction to the passage of the food. We can quite see that by increasing artificially the intra-abdominal tension by a belt or other support we shall be helping the stomach and prevent this kink from taking place. We are all agreed upon this point, but the difficulty comes in when we try to find a belt or support which will efficiently support the lower part of the abdomen without annoying the patient. All belts appear to be useless unless provided with straps or cords passing between the legs over the perineum, as without them they will rise up and not keep their position. An ideal belt is yet to seek, and we apply in vain to the instrument-makers for such a contrivance. At present the best abdominal support is the plaster belt of Dr. Achilles Rose, but this is apt to irritate a sensitive skin.

In addition to the use of a mechanical support we may greatly assist the stomach to empty itself by directing the patient to lie down towards the end of the digestive period upon an inclined couch. If the foot of the couch is raised a couple of inches and the patient lies with the head low, we enlist the force of gravity in our service and take off the weight and drag of the prolapsed stomach. Usually the mistake is made of directing the patient to lie down directly after meals. This is of course much too early, as at that period there will be no food ready to pass through the pylorus.

Measures for the prevention of gastritis.—The most important of these will be included in the diet proper for the atony and by the lavage which the case will probably require; but in addition we should make sure that the mouth of the patient is in an aseptic condition. Many cases of chronic gastritis are caused and perpetuated in spite of treatment by small quantities of irritating pus which are continually swallowed by patients affected with some forms of Rigg's disease. We must therefore get a dental surgeon to remove

all septic and necrosed stumps from the mouth, and to cure any pyorrhœa alveolaris by the application of nitrate of silver or its equivalent to the interior of the pus pockets after all particles of tartar have been removed from the roots of the teeth.

Hollow teeth must be filled and teeth which have been lost replaced by artificial ones, in order that the patient may have no difficulty in reducing his food to the required fineness of subdivision.

The management of the Diet.—The first essential is the regulation of the food which is consumed by the patient.

Diet in atony of the first degree.—In this stage whilst there is impairment of contractility the stomach is yet able under ordinary circumstances to empty itself in six hours. Our treatment is thus comparatively easy and should be invariably successful. The main points to be attended to are—

1. The meals should be moderate in amount.

2. They should consist of substances which are normally digested in about three hours.

3. The amount of liquid taken at meals should be limited and taken if possible at the end of the meal.

Hot drinks, effervescing mineral waters, and sparkling wines must be avoided. One small cup of tea or coffee may be allowed for breakfast, and then nothing more until twelve o'clock, when a tumbler of Contrexeville or St. Galmier water may be sipped. We shall find that many patients with atony have been drinking large quantities of hot water on an empty stomach with the idea of curing themselves of indigestion. This practice must at once be put a stop to, as quite apart from its having been one of the probable factors in the production of the condition, it will certainly tend to perpetuate it if not discontinued.

4. There should be an interval of five hours between each meal.—In this the first degree of atony, where there is no

absolute retention of food residues and consequently no fermentation in the stomach, we need not exclude articles of diet such as sugar, we may give roast or boiled meat *ad libitum*, and boiled eggs if they agree, and we need not comminute the food, but trust to careful mastication and digestion in the stomach to reduce it to such a condition that it will pass easily through the pylorus. Bread should be cut into thin slices and well toasted in order that the envelopes of the starch granules may be ruptured and its further digestion facilitated. An additional advantage will be that the lactic acid germs which are usually present in the centre of loaves of bread will be destroyed. For this reason small well-baked rolls are to be preferred to ordinary bread when toast is not to be obtained. The partial dextrinization of the starch by the heat used in toasting will also favour digestion.

Diet for atony of the second degree.—In this stage the stomach is unable to empty itself before the next meal—that is in six hours—but manages to do so during the night, and is therefore empty before breakfast.

In this stage we must enforce a stricter diet than in the first stage, as now we have to do with a real stagnation of food in the stomach, in which it remains longer than it should do. We must not forget that the presence of the food will keep up the secretion of the gastric juice in many cases; and as the amount secreted is considerable, this will add to the embarrassment of the organ.

The main points upon which we must insist are—

1. Meals of smaller quantity than ordinary.

2. More frequent meals. In this stage we may with advantage order five meals; at 8, 11, 2, 4.30, and 7.30 respectively.

3. All foods which do not undergo digestion in the stomach must be prepared in such a manner that the weakened organ can expel it easily through the pylorus. It is not so much

the kind of food which is of importance as the condition of comminution in which it is presented to the stomach. As regards the choice of proteid or farinaceous food to form the staple of the diet, we must be entirely guided by the condition of the gastric secretion. When hydrochloric acid is in excess we naturally limit the amount of starchy food or give it in a predigested form. When pepsin and hydrochloric acid are in defect we may allow amylaceous substances to predominate in the dietary. Alcohol should be avoided as much as possible because, as Von Mering has pointed out, it causes an excessive pouring out of fluid into the stomach, and consequently tends to increase the dilatation.

Diet in the third stage of gastric atony.—In this stage we have food residues permanently retained in the stomach, which is never able to completely empty itself.

The problem here is a much more complicated one, and will require the greatest skill on the part of the physician and perseverance on the part of the patient.

The most rational scheme of diet is to commence with a period of absolute rest for the stomach, during which food is only given by the rectum and serious efforts are made to restore some degree of tone to the stomach by electrical or other intragastric means.

During this stage the patient must remain in bed with the two-fold object of limiting the waste of the system and of placing the stomach under the best mechanical conditions.

The next step will be the cautious administration of small quantities of liquid food, at the same time continuing the nutrient enemata. Thickened soups, gruels, meat juices, and jellies must be given in carefully regulated doses. From this point the feeding will be practically the same as in atony of the second degree, with the important difference that whilst in the milder stage a simple limitation of fluid

usually suffices, here, where there is permanent retention of food residues, a large proportion of the amount necessary for the maintenance of the body must be given by the rectum for a considerable period.

As the stomach regains its tone we shall gradually increase the quantity and consistency of the food given by the mouth, leading the patient up the culinary scale through semi-solids, porridges, and pastes until solid diet is reached. At the same time the number and frequency of the nutrient enemata are reduced until they are entirely discontinued.

It is important to bear in mind that the severer and more advanced stages of atony of the stomach will require a very rigid diet if we wish to obtain good results. The first important point to fix in our minds is that we cannot diet these patients according to a stereotyped plan, and discharge our obligations by handing them a diet table constructed on a procrustean plan to suit the different stages of the complaint. To obtain good results we must scientifically adjust our dietetic prescriptions to the capabilities of the stomach, and be entirely guided by the manner in which we find it able to deal with any particular article of food. In other words, we must eliminate routine prescribing and guess-work as much as possible from our practice and deal with ascertained facts.

The method of carrying out these principles is simple in the extreme and only requires a little intelligent work, based upon the following matters of common knowledge :—

1. The body requires a certain amount of food to enable it to exist and replace the waste of living.

2. We can measure the requirements of the body sufficiently accurately for practical purposes in what are known as "calories"; that is to say, by degrees of energy reckoned as heat.

3. We have ascertained experimentally the value in "calo-

ries" of all the common food-stuffs; in other words, we know the amount of energy which they will generate by their oxidation in the body.

With these data before us we can easily construct a diet containing a sufficient number of calories to sustain the equilibrium of the body, and from the long list of articles of food at our disposal we can select those which theoretically should be easiest of digestion, or the digestion of which has been experimentally ascertained to take place in three or four hours, and we can order these articles of diet in a finely divided form.[1]

But, so far, we have been doing the very thing against which we have been warned. We have constructed a theoretical diet-table to suit the stage of the disease. The difference, however, is in the use which we shall make of it. Instead of giving it to the patient and telling him to follow it, we only use it as a basis for our further work.

We only give it to the patient experimentally and tentatively, and check the results obtained by extracting and examining of the patient's stomach contents at six hours after a meal if he is in the second stage, at fourteen hours if he is in the third. If at this examination we find that any article of food has passed out of the stomach we may safely allow it. If *per contra* we find it present in the stomach, we try in succession the effect first of giving it in a more finely divided form, secondly of reducing it in quantity. If with the assistance afforded by either of these the stomach is still unable to get rid of it, we have no alternative but to eliminate it from the diet altogether and replace it by some other food of equal caloric value. We can thus by a process of trial and error gradually arrive at the diet which will enable the patient to get the largest amount of nutriment and at the same time secure the most

[1] Tables giving food values in calories and the time of digestion will be found in the Appendix

complete emptying of the stomach possible in the stage of the disease at which he has now arrived. Another point which must guide us in the selection of articles of diet will be the composition of the gastric juice and its observed effects upon the food. If, for example, we find that hydrochloric acid is in excess and that in consequence farinaceous food is badly digested in the stomach, we shall naturally reduce it in amount, replacing it by animal substances, or else order diastase to assist the work of starch conversion, whilst we control the superacidity by appropriate medication. On the other hand, any diminution in the hydrochloric acids and ferments will lead us either to diminish the amount of meat; to take steps that it be reduced to a condition of extreme comminution in order to shift the onus of digesting it on to the intestine; or to administer pepsin, papain, or bromelin to reduce it to that consistency as shall enable it to pass the pylorus as easily as possible.

The use of drugs.—We may require to administer drugs in the treatment of atony of the stomach to fulfil any of the following special indications:—

To neutralize an excess of hydrochloric acid.—This part of the subject has been already discussed in the chapter dealing with hyperchlorhydria.

To control abnormal fermentation.—Antiseptic drugs may be introduced into the stomach, and in conjunction with lavage and appropriate diet may be helpful for this purpose. By themselves I believe them to be perfectly futile in the direction of arresting abnormal fermentations in the stomach. Hydrochloric acid is sometimes given with this object, but I think without sufficient evidence of any good resulting from its use. We know very well that it is almost impossible to raise the gastric acidity sufficiently to sterilize the contents of the stomach by the small medicinal doses usually administered. We are also familiar with the fact

that fermentations progress, often to an extreme degree, in the stomach of patients suffering from hyperchlorhydria. The futility of expecting ten minims of dilute hydrochloric acid to arrest gastric fermentation must therefore be sufficiently obvious. The drugs which have been found most useful in modifying gastric fermentation are salicylate of bismuth, sulphocarbolate of soda, beta-naphthol bismuth, resorcin, and salol. Carbolic acid is often given with this object, but I am unable to understand what effect the one or two grains taken can have upon the half-pint or so of stomach contents, and must come to the conclusion that the amelioration of the symptoms which occasionally undoubtedly follows its use is to be accounted for by some local action upon the mucous membrane of the stomach. Lately the peroxides of magnesium have been advocated as gastric antiseptics, as they are decomposed in the gastric juice with the evolution of free oxygen, but it is too soon to speak of their efficacy as they are yet upon their trial. Solution of peroxide of hydrogen (glycozone) has been tried with the same idea, and theoretically should be of some use, but I have found it irritate the stomach to such an extent that in most cases I had to discontinue its use. I think that taking everything into consideration we shall be well advised if we attempt to control the fermentation in cases of gastric myasthenia by a systematic use of lavage, at the same time taking care to preserve the mouth and teeth in an aseptic condition, and thus limit the number of germs entering the stomach with the food.

To assist the comminution of food and consequently its passage through the pylorus.—I suppose we are all practically agreed now that the administration of pepsin and pancreatin with the idea of assisting the digestion of food in the stomach is of very little use. When the pepsin is apparently in defect the proper course is to give hydrochloric acid, as except in cases of advanced atrophy of the gastric mucosa

it is generally present in the inactive form. But the digestive ferments may be usefully given towards the end of digestion, to assist in dissolving food residues and thus help them to pass the pylorus. Whether pepsin and acid or pancreatin and alkali are given will depend upon the condition of the gastric chemistry.

To assist in restoring tone to the muscular substance of the stomach.—We have two drugs which may be especially useful to us for this purpose, although all the vegetable bitters appear to act more or less in the same direction. They are strychnia and suprarenal extract. In cases of myasthenia of the first degree strychnia in small doses is often promptly curative, but must be given with caution in cases associated with neurasthenia, as in this condition it is often contra-indicated.

Suprarenal extract has been warmly advocated by Mancardi, who gives it both by the mouth and as enemata. I have given it by the mouth in several cases with excellent effect, but the effect appeared to me to be fugitive. I think that the best results possible in any particular case will be obtained by the use of strychnia in conjunction with an appropriate form of electricity.

Lavage.—Having duly attended to the points already discussed, the question of washing out the stomach will arise, and upon this subject much misconception still exists. By many, lavage is erroneously regarded as a kind of panacea for all stomach troubles if the patient can only be persuaded to submit to it. Such is far from being the case in reality, and in many affections of the stomach it would be the worst kind of treatment. By lavage, as distinct from irrigation with medicated solutions, we can remove fermenting residues of food or irritating secretions from the stomach; and as a matter of practice with certain exceptions we should never use this method of treatment when these are not present. There are a few main principles which should guide us in

the use of lavage in cases of atony of the stomach, which may be enunciated as follows:—

Atony of the first degree.—As in this stage the stomach empties itself in only a little over the normal time lavage is superfluous, and by using it we should only be damaging the stomach and putting the patient to unnecessary inconvenience. In cases complicated with chronic gastritis, hyperchlorhydria, or hypersecretion we shall of course in many cases have to wash out the stomach and also make use of intragastric sprays and douches.

Atony of the second degree.—In the treatment of this stage of atony we should lay down the definite rule that lavage is never to be used unless there is distinct evidence of fermentation. We know that in this stage the stomach is always able eventually to empty itself during the night, although it usually cannot manage to do so before the next meal. It therefore necessarily follows that if we remove its contents before it has emptied itself, we are depriving the patient of nourishment which in the ordinary course of things he would be able to utilize. If on the other hand we wash out the stomach after it has emptied itself, we can effect no possible good and are quite likely, if we are not very careful, to further weaken the stomach by stretching it. I am aware that in these cases lavage has been recommended by some authorities for a massage effect which it is supposed to exert on the stomach wall; but my experience has shown me that for this purpose the intragastric needle-douche is far superior. In cases of atony of the stomach accompanied by fermentation of food occasional lavage will be required, and we must use it in such a manner as to interfere as little as we can with the utilization of food. With this aim we wash out the stomach before breakfast, and thus allow the stomach as long a time to empty itself as possible. The effect of lavage in these cases is often very marked. After washing out the stomach a few times the fermentation ceases,

and by means of the other methods employed the stomach recovers its power of emptying itself before it occurs again. In cases complicated by hypersecretion it has been found that the best results are obtained by washing out the stomach before the evening meal.

Atony of the third degree.—In this stage food residues are permanently retained, and the stomach never completely empties itself. Fermentation is practically always present.

1. In cases where the fermentation is slight it will be sufficient to wash out the stomach before breakfast. This will give the stomach the whole night in which to empty itself, and morning lavage three or four times a week will probably keep it free from germs.

2. Where the fermentation is considerable, we must try an entirely different plan. A light meal which is of such a nature as to be theoretically digested in three hours is given at 7 p.m., and the stomach well washed out at 11 p.m. The stomach will then be empty all night, and after a few days fermentation should cease. When this occurs we can revert to the morning lavage.

3. In cases in which fermentation is complicated by continuous hypersecretion, the irritation of the retained food residues keeps up a continual secretion of hydrochloric acid. To remedy this condition we must keep the stomach as clear of food residues as possible, and to this end we must wash it out twice daily—once before the evening meal, and again before breakfast.

Before dismissing the subject of lavage, I would lay stress upon the fact that the most important practical points which should be kept before us are the following:—First of all we must avoid introducing large quantities of water into the stomach, or we run the risk of increasing the atonic condition. One pint is the largest quantity which should be introduced at one time, and we must make certain by actual measurement that this pint has been removed before

we introduce any more. If it will not come away by syphonage we must extract it by aspiration. Secondly, we must not wash out the stomach more often than is absolutely necessary. As soon as fermentation has ceased, we must ascertain by experiment the fewest number of washings per week which will keep the stomach free from food residues and take care that we do not exceed them. Of course, as the case progresses towards recovery the necessary number of lavages will be further reduced.

Electricity.—There can be no doubt that the use of modern electrical methods has inaugurated a new era in the treatment of atony of the stomach. I use the term "modern methods" advisedly, as until the introduction of sinusoidal currents into medical work and the use of the intragastric electrode, the application of electricity for the cure of this affection was generally admitted to be not merely disappointing, but practically a failure.

As a matter of fact, the chapters in medical works relating to the action of electricity upon the stomach must of necessity be rewritten, as the results obtained by obsolete apparatus and imperfect methods can only mislead the student as to the true value of this therapeutic agent.

And even at the present day, I am sorry to say that the knowledge of the proper technique is, in this country at any rate, in the hands of a very few specialists and has not yet reached the great bulk of the profession. It is in the power of any of my readers to prove these statements for himself. First let him ask the most eminent hospital physician with whom he is acquainted how he would apply electricity to attempt to cure atony of the stomach and what his experience has been as to the results obtained. The answer will most probably be that either the galvanic or faradic current has been applied by moist electrodes to the surface of the abdomen, and that the results obtained were disappointing.

And, on the other hand, the medical man who devotes his

attention solely to electricity, as a rule has not the special knowledge of diseases of the stomach which will warrant him in undertaking cases requiring the introduction of instruments into it. And so erroneous statements find their way into the text-books, and are copied from one to the other, as to the uselessness of electricity in gastric disorders, simply because the writers either did not know enough about electricity or stomach diseases respectively to make their results of the slightest scientific value.

There are two specialities in which, in order to succeed, one must have a thorough practical acquaintance with electricity in addition to purely medical knowledge, viz. diseases of the nervous system and the diseases of the stomach. For instance, in treatment of atony of the stomach, after we have arranged the diet, washed out the stomach, supported the lower abdomen, and ordered a course of strychnia, without electricity we can do practically nothing more except wait and hope that these measures may eventually effect a cure. It is indeed true that they will sometimes do this after months or years of perseverance, but more often the relief is, at the best, only of a very partial nature, and the patient for the rest of his life is obliged to abide by strict dietary rules, from which he can never depart without a relapse.

But if in addition to these other measures we have electricity at our disposal, it is in our power to cure practically all the slight cases and many of the more severe forms accompanied by retention of food residues. We can cure all the slight cases in which there is merely loss of contractility without retention of food; we can cure a great many of the cases of the second degree in which the stomach does not empty itself in six hours, but does so in twelve. Those cases which we cannot absolutely cure we can bring back to the first stage, and although we may not be able to completely restore the normal contractility, we can do so to the extent of enabling the stomach to habitually empty itself in

six hours. As regards cases of the third degree in which the stomach does not empty itself during the night, some unfortunately come to us too late, and these we are unable to relieve; some are entirely cured; but the majority are so far improved that the disease is converted to one in the second stage. It is now empty before breakfast, but residues will occasionally be present six hours after a large meal. But this, anyway, is a great gain, as the patient, from being in a condition of continual misery, is now able, with occasional lavage and a reasonable attention to diet, to live a life of usefulness and comfort.

But the good results to be obtained by electricity depend upon three things—

1. The selection of the proper kind of electricity;
2. A proper technique on the part of the operator; and
3. A willingness on the part of the patient to undergo treatment for the requisite length of time, although he is apparently not receiving the magical and immediate benefit he doubtless hoped for, and perhaps expected.[1]

Massage.—Of ordinary manual massage very little need be said. Theoretically it should be of the greatest use; practically it usually fails to achieve any useful purpose in the treatment of gastric atony. Personally I have never seen the slightest good effected from the use of this agent in the treatment of gastric myasthenia. The reason is probably not far to seek. In the hands of Zablodowski (*Berlin. klin. Wochenschr.*, 1886, No. 26) and of other physicians skilled in the special technique of emptying the stomach by manipulation, it has been credited with brilliant results. These, however, are not reproduced by the ordinary masseur and masseuse.

To be of value in the treatment of atony of the stomach it

[1] For the technique of the use of electricity in gastric myasthenia the reader is referred to the Author's work, *Electrical Methods in the Treatment of Affections of the Stomach and Intestines.* London, A. Siegle, 1905

requires such special technical knowledge that unless administered by the physician himself it is useless. Few of those who practise massage, with whom the market is at present flooded, have had an opportunity of acquiring this. Indeed it is no exaggeration to say that massage administered by the average masseur may be *actually dangerous* in certain cases. Few of the operators who have been trained in the usual way know enough to render their manipulations of the abdomen even reasonably safe in some of the conditions met with in dyspepsia. A vastly superior method of treatment, albeit not so efficacious as modern electrical methods, is to be found in mechanical vibration, or as it has recently been termed, sismotherapy.

The earliest use of vibration as a therapeutic agent was probably by Ling, followed by Zander, who had already been for some time treating various nerve troubles with it when, in 1877, Hovath[1] made a preliminary communication upon the subject to the Société de Biologie. In the following year he published a systematic paper dealing with the influence of rest and movement upon life, and in which he claimed to be able to sterilize a fluid containing germs by the action of prolonged shaking. In the same year Vigoroux,[2] working in Charcot's clinic at the Salpêtrière, commenced to try the effect of systematic vibration in certain forms of nervous disease. As he appears to have worked chiefly upon hysterical subjects, his results must be discounted, but on more than one occasion he appears to have materially relieved the pains of tabes. In 1880 Reinke published a valuable paper upon the effect of vibration, in which he stated that the growth of germs was distinctly retarded by acoustic vibrations. In the same year Baudet[3] pointed out that it was

[1] Alexis Hovath, "Ueber den Einfluss mechanischer Erschütterung auf die Entwicklung der Spaltpilze," *Pfluger's Archiv,* Bd xxiii, 1880, p. 434

[2] Vigoroux, *Progrès médicale,* 1878, p. 746.

[3] Baudet, "Traitement de la douleur par les vibrations méchaniques," *Progrès médicale,* 5 février, 1881.

easy to produce local anæsthesia by mechanical vibrations, and that in this way various pains could be efficiently treated.

The first English worker in this field appears to have been Mortimer Granville, who, after several articles in the journals during 1882, published in the following year a small book dealing very fully with the technic of the subject.[1] The instrument which he devised for the purpose of producing the vibrations consisted essentially of a powerful electro-magnet, which was fitted with a vibrating armature on the principle of the contact-breaker of a faradic coil. To this armature was attached a rod terminating in a disc or brush for application to the patient. The whole contrivance was portable, the electro-magnet being covered with leather and held in the hand. It was possible with this instrument, by shifting the platinum contact, to get vibrations at two different speeds. The disadvantages attaching to the instrument were—

1. The difficulty of maintenance. Owing to the large current required to work the machine, the platinum contacts required to be frequently renewed.

2. The effect of its application was not a true vibration, but really a rapid succession of blows. When pressed firmly upon a bony surface the subjacent parts were thrown into vibration, but this was an antero-posterior one, and not a lateral movement.

Since Granville's book the chief writings upon the subject which have appeared are articles by Schmidt,[2] Meltzer,[3] and Charcot.[4] The most important of these is that of Meltzer, whose experiments are of great interest. He shows us conclusively that vibration produces a direct shaking up of

[1] Mortimer Granville, *Nerve Vibration and Excitation* London, 1883

[2] Schmidt, "Ueber den Einfluss der Bewegung auf das Wachstum und die Virulenz der Microben," *Archiv fur Hygiene*, 1898, Bd xxii

[3] Meltzer, "The Importance of Vibration to Cell Life," *New York Medical Journal*, December 24th, 1892

[4] Charcot, "La Médecine vibratoire," *Le Progrès médicale*, 1892, p. 131

molecules, of which the ground substance of cells is composed. It is therefore *a priori* most probable that vibration will affect metabolism in some way or other. He concludes, as the results of his observations, that vibration modifies nutrition, and maintains that growth is stimulated by mild vibration, and that strong vibration produces rapid catabolism.

The modern appaiatus for the administration of vibratory massage consists of an electro motor, which communicates (by means of a flexible cable) reciprocating motion to a plate or pad designed for application to the patient. This plate is carried on a rod projecting from a handle within which is the essential mechanism, consisting of a cam or eccentric. In the most recent form of apparatus the motor and cable are dispensed with, and the vibratory movements are produced by compressed air, which is carried to the handpiece by means of a tube from a tank in which it is stored. Unfortunately the treatment of disease by means of vibration has drifted largely into the hands of unqualified persons, who have been quick to perceive that in it they found a means of treating disease which required apparently neither anatomical nor medical knowledge and in the use of which unpleasant accidents were practically impossible. This is quite true up to a certain point; it is easy enough to apply vibration to a patient, but to produce good results is quite another story, for in order to benefit a patient with a gastric atony it is necessary—

(*a*) To have an exact knowledge of the position and boundaries of the viscera in the particular patient under treatment.

(*b*) To be able to select the proper dose as to amplitude, depth of vibrations, duration of and the frequency of the application, in order to secure just the fullest amount of mechanical effect short of fatiguing the structures and tissues treated.

(*c*) To be able to make proper periodical examinations of the gastric motility, the composition of the gastric juice, and the length of the digestive period, and thus to gauge and measure the effects produced.

And it is just these things which require an expert scientific medical man, and are far beyond the capabilities of a trained nurse or attendant, even though they have attended the lectures at a massage school and have been dismissed with a certificate as competent to practise massage and "medical electricity"!

We may sum up by saying that made use of scientifically vibration will frequently give very good results, and may therefore be used when the proper form of electricity is not available.

Brief reports of cases illustrating diagnosis and treatment.

Gastric myasthenia of the first degree.

Mr. F. H., aged fifty-four. Has been troubled with his stomach for the last twenty-five years; fifteen years ago was in bed for a week with acute dyspepsia. *Symptoms:* November 17th, 1899. Pain and hardness at the pit of the stomach an hour after meals; constipation; sinking feeling; agorophobia; claustrophobia; has attacks in which he bursts out into a cold perspiration; considerable belching of wind. *Objective:* Slight dilatation of the stomach; no residues six hours after a meal. *Diagnosis:* Atony of the first degree. *Treatment:* Sinusoidal hydro-electric baths three times a week. *Result:* Practically cured after one month's treatment.

The Rev. C. M., aged thirty-four. September 18th, 1902. Flatulence; fulness after meals; drowsiness after dinner; constipation; loss of memory and the power of sustained mental or physical effort. *Objective:* Splashing to the umbilicus four hours after a meal; no food residues six hours after test meal. *Diagnosis:* Nervous indigestion.

Atony of the first degree. *Treatment:* Triphase alternating current by external electrodes three times a week. *Result:* October 2nd, practically well.

Mr. P., aged thirty-four, consulted me in December, 1902. Never been well since an attack of diphtheria at the age of seventeen years. *Symptoms:* Never feels comfortable about his stomach. Always sensation of heaviness, worse after meals. Brings up a great quantity of wind. Has lost weight during the last year. *Objective:* Splashing below umbilicus; no residues six hours after a test meal; gastric chemistry normal. *Diagnosis:* Atony of the first degree; gastric neurasthenia. *Treatment:* High frequency; auto-condensation; effluviation of abdomen. *Result:* Complete cure in three months.

Mr. L. W., aged thirty-four. January 26th, 1903. *Symptoms:* Fulness after meals; pain; flatulence; belching of wind. *Objective:* Splashing to umbilicus four hours after breakfast. *Diagnosis:* Atony of the first degree. *Treatment:* High-frequency current to abdomen. *Result:* Cure from six weeks' treatment.

Mr. E. F. C., aged twenty-eight, consulted me first in August, 1901, and was then cured by non-electrical treatment. Fourteen days ago had a relapse, probably due to a chill. Complains of faintness and feeling of sickness after food. Has lost eight pounds in the last few months. *Objective:* Splashing as low as the umbilicus five hours after breakfast. *Diagnosis:* Gastric neurasthenia; atony of the first degree. *Treatment:* High-frequency electricity; condensation couch, followed by local application of the resonator current to epigastrium. *Result:* Apparent cure in three months.

J. C., aged sixty. March 24th, 1904. *Symptoms:* Extremely distressing eructations after food with belching of large quantities of wind; appetite bad; constipation. *Objective:* Splashing through the whole of the digestive period;

no food residues six hours after a mixed meal; salol reaction appears in two hours. *Diagnosis* Atony of the first degree. *Treatment:* Daily application of the currents of high frequency, by monopolar derivation from small solenoid, followed by effluviation of abdomen. *Result:* Practical cure in six weeks.

Gastric myasthenia of the second degree.

Miss D., aged forty-five. Five years ago had influenza severely. Since then has suffered with her stomach. At first the trouble came on in isolated attacks; latterly it is almost constant. *Symptoms:* November 1st, 1899. Flatulence; great pain coming on about an hour after food; is often kept awake at night by pain and acidity; pain sometimes terminates by vomiting, which relieves it for a time; vomit is invariably very acid. *Objective:* Splashing to three inches below the umbilicus; residues containing 40 degrees of free HCl six hours after a mixed meal. *Diagnosis:* Atony of the second degree; continuous hypersecretion. *Treatment:* Lavage; galvano-faradic current by intragastric electrode. *Result:* By the end of December, 1899, the food residues have disappeared and the general condition has greatly improved.

Mr. L. H., aged thirty-eight. May 20th, 1902. Has had dyspepsia for eight years. *Symptoms:* Debility; pain after meals; flatulence; loss of appetite; discomfort in the early morning, located in the right iliac region—this often wakes him up; sleep much disturbed; occasional vomiting. *Objective:* Right floating kidney; food residues six hours after a meal, but the fasting stomach before breakfast is empty; after an Ewald test breakfast, total acidity 98, free hydrochloric acid 75; by the water test, out of 640 c.c. introduced into the stomach, 687 remain at the end of two hours. *Diagnosis:* Atony of second degree; hypersecretion. *Treatment:* Lavage; nitrate of silver spray; high-tension induction-coil current with very rapid interruptions by means of

intragastric electrode. *Result:* After three months' treatment the stomach contained no food residues six hours after a Riegel test meal. After Ewald test breakfast total acidity was 65, free hydrochloric acid 35. The patient relapsed in 1903, but recovered after a short course of six weeks.

Miss M., aged sixty-five. June 3rd, 1902. *Symptoms:* Nausea, occasional vomiting; fulness and distension after meals; acidity; bitter risings; flatulence and belching. *Objective:* Food residues six hours after meals. *Diagnosis:* Atony of the second degree. *Treatment:* Triphase sinusoidal current by external electrodes. *Result:* Very much improved by six weeks' treatment.

Lieutenant P., aged twenty-six. Good health till he went to Africa; enteric in 1901; was in hospital at Bloemfontein for three weeks; two days after he ate solid food was taken with pain in the stomach and dizziness; was invalided home July, 1902. *Symptoms:* Fulness and tightness after every meal, however small; considerable belching of wind; no pain; appetite moderate; constipated. *Diagnosis:* Atony of second degree. *Objective:* Food residues six hours after meals; fasting stomach empty; gastric chemistry normal. *Treatment:* Triphase current by external electrodes; appropriate diet; occasional lavage. *Result:* Cure in three months.

Mr. C. B., aged fifty-two. Has had attacks of colic for seven years. At first two or three times a year, latterly more frequently; thinks he can usually trace the attack to something which has disagreed. The attack usually commences at night shortly after he has retired to bed. First of all he brings up wind, then follows pain which is sometimes so severe as to double him up, then vomiting which affords relief. He has often brought up articles such as French beans which he remembers having taken at his midday meal. Vomit tastes bitter. After an attack he is prostrate.

He lives for two or three days on slops, and then gradually gets back on his normal diet. March 4th, 1903. *Symptoms:* Has now just recovered from a typical attack; feels tolerably well, with the exception of fulness and weight, and drowsiness after meals. *Objective:* Food residues six hours after food; fasting stomach empty. *Diagnosis:* Motor insufficiency. Atony of second degree. *Treatment:* As the patient refused to submit to a gastro-enterostomy which was indicated, regular lavage was ordered, with the use three times a week of the high-tension induction-coil current by means of an intragastric electrode. *Result:* A year afterwards his medical man writes that with appropriate diet, regular lavage, and occasional short courses of electricity the compensation is maintained, and no attack has been experienced. The pyloric stenosis appears to be moderate in amount and not progressive.

Miss K., aged twenty-nine, was sent to me on April 18th, 1904. Has had indigestion for three years. Present illness commenced ten weeks ago with vomiting which lasted all the afternoon and evening. The vomit was acid, and the pain was relieved when it came up. *Present condition:* April 18th, 1904. Has been ten weeks on slops; constant retching even if no food is taken; continuous belching even when the stomach is empty; food of any kind, even liquid, causes pain shortly after it is taken. *Objective:* No tender spots: stomach contains food residues six hours after food; fasting stomach empty. *Diagnosis:* Fermentation. Atony of second degree. *Treatment:* Triphase current with intragastric electrode; lavage. *Result:* After six weeks no food residues can be found six hours after meals: symptoms much relieved.

Mr. H., aged thirty-eight. Commenced to be troubled with his stomach thirteen years ago when he commenced to have business worries; illness is in the form of attacks lasting about a couple of weeks and occurring every six

months or so; between the attacks he has a constant uneasy sensation in the stomach. *Symptoms:* January 1st, 1902. He can usually feel an attack coming on, the first symptoms being that he is unable to do his work and makes mistakes; this is a serious matter to himself (and others) as he is a dispensing chemist by profession; this goes on for a certain time, when he collapses utterly and cannot compose himself or concentrate his mind; he is at the present moment about half-way through an attack; he has no appetite, considerable flatulence and weight at the pit of the stomach but no actual pain; he has constant sensations of terror and feels "waves of dread passing over him". *Objective:* The stomach note extends two inches below the umbilicus; food residues are present six hours after meals but not before breakfast. *Diagnosis*. Dilatation. Atony of second degree. *Treatment:* Positive static insulation; Morton current to stomach; lavage. *Result:* The attack passed off within a week instead of lasting the usual time; six months after the termination of the treatment there were no residues and the patient had had no more attacks; a year afterwards he writes that he has been free from attacks and is in excellent health.

Gastric myasthenia of the third degree.

Mr. H. D., aged thirty-eight. Has been troubled with indigestion for some years; a few months ago suffered for a considerable time from looseness of the bowels coming on suddenly without any time relation to food; has for many years taken a considerable amount of alcohol during the day. *Symptoms:* December 5th, 1900. Nausea and retching before breakfast; every few days he gets an attack of abdominal pain terminated by vomiting; is intensely depressed and miserable. *Objective:* Stomach contained food residues, free HCl, and mucus twelve hours after ordinary mixed meal; considerable tenderness in region of epigastrium. *Diagnosis:* Chronic gastritis. Atony of third

degree. *Treatment:* Methodical lavage; Morton current to abdomen; positive static insulation. *Result:* By January 30th, 1901, he was distinctly better in many ways; hardly any dyspepsia, and no food residues; the ultimate result was unsatisfactory as the patient refused to continue the restrictions upon his diet and habits and eventually relapsed.

Mr. T., aged fifty-four, consulted me on October 20th, 1902. Has suffered with his stomach for seven years. *Symptoms:* Sinking feeling three hours after breakfast relieved by food; again between four and five in the afternoon; often has severe pain during the night. *Objective:* Fasting stomach contains about eight ounces of greenish fluid containing a considerable quantity of free HCl; food residues containing HCl are present six hours after test meal. *Diagnosis:* Atony of third degree. Hypersecretion. *Treatment:* Lavage, alkalies; high-frequency current, one electrode on tongue and one upon epigastrium. *Result:* Under this treatment very little improvement took place, but a cure soon resulted when the current from the high-tension induction coil was used with an intragastric electrode.

Miss B., aged thirty-six. February 5th, 1904. Periodical attacks of vomiting; constant pain in epigastrium relieved by rest in bed; loss of weight; anorexia. *Objective:* Greater curvature of stomach reaches nearly to pubes; lesser curvature one inch above umbilicus. *Diagnosis:* Gastroptosis. Motor insufficiency. *Treatment:* Continuous galvanic current applied by her own medical man; proper support to lower abdomen. *Result:* On April 26th patient reports that she has had no attack of vomiting for nine weeks; pain much less; gain in weight of two pounds.

Mr. M. O., aged forty-eight. Consulted me on April 6th, 1904. Present illness dates from an attack of typhoid in 1901. *Symptoms:* Flatulence and constipation; the belching of wind is the chief trouble, as it occurs after each meal, and

as soon as he lies down at night, and often keeps him awake a considerable time; is unable to make himself sick (this is a common symptom in cases of atony of the stomach). *Objective*. Food residues before breakfast. *Diagnosis:* Dilatation. Atony of third degree. *Treatment:* Triphase alternating current with external electrodes. *Result:* Patient improved but did not continue long enough under treatment to be cured.

Mr. S. B., aged thirty-one. April 6th, 1904. Has had dyspepsia for ten years. Latterly has suffered from vomiting after food. *Objective:* Splashing in the morning before breakfast; stomach contains food residues before breakfast; 300 c.c. of water remains in the stomach three hours. *Diagnosis:* Myasthenia of third degree. *Treatment:* Appropriate diet; daily application of the triphase current with an intragastric electrode. *Result:* By the end of May food residues could no longer be found before breakfast, but were still to be obtained six hours after a mixed meal. After two months' longer treatment complete recovery ensued, and food residues entirely disappeared from the stomach.

In concluding this chapter I wish to lay stress upon the fact that the physician treating a case of gastric myasthenia by any of the methods which I have described must not be satisfied by any vague assertions on the part of the patient that "he is better". Having ascertained in the first place the exact condition of affairs, having estimated the time during which food remains in the stomach and the length of the digestive process, he must at intervals during the course of treatment repeat his tests. *And he must not be satisfied that his treatment is producing favourable results unless there is progressive shortening in the time which the stomach takes to empty itself and diminution in the amount of food residues.*

Another point is to insist upon a course of treatment of a sufficient length. There is no magic in any mode of treat-

ment, even electricity, which will enable it to immediately restore power to a weakened and wasted muscle. These things cannot be hurried, and for one's own reputation it is better not to undertake the treatment of patients who are unreasonable enough to grudge the time necessary to give a fair trial to the means which it is proposed to use.

CHAPTER V.

NERVOUS INDIGESTION OR GASTRIC NEURASTHENIA.

In order to study this portion of our subject, it is necessary to have first of all a distinct idea of what is meant by neurasthenia, and be acquainted with the characteristic signs and symptoms of that affection. This condition has long been recognized as worthy of a distinctive name, but only within comparatively recent times has the term neurasthenia been, so to say, legitimized as applied to it, and only after a considerable amount of opposition on the part of the profession. But the neurasthenic state is so exceedingly common in everyday practice, that it is a matter of convenience to possess a distinctive name which we may use in the same way as the word indigestion, to describe a collection of symptoms and phenomena without committing ourselves as to any particular views as to their pathology.

Pathology of neurasthenia.

The exact pathology of neurasthenia has been the subject of much speculation. Considerable light has, however, been thrown on the subject by the researches of Hodge, who discovered changes in the nerve cells of swallows, pigeons, and bees after fatigue; of Mosso, who obtained fatigue signs by injecting the blood of an exhausted animal into one at rest; and of Jurgens, who discovered degeneration of the plexuses of Meissner and Auerbach in cases of gastric neurasthenia.

It is probable therefore that neurasthenia may arise from more than one cause, and that we may have it depending upon—

(*a*) Real fatigue from overwork.

(*b*) Nerve poisoning from the circulation in the system of toxic substances.

(*c*) Actual degeneration of the nerves or their nuclei.

It is probable that with the improvement which is continually taking place in our methods of research we may eventually find changes in the nervous system which are yet too gross to be demonstrated with our present instruments, and that we may be thus compelled eventually to admit an anatomical basis for many affections which we now regard as purely functional.

A person may be directly predisposed to acquire neurasthenia either by personal influences of an exhausting nature or by heredity, for any condition in the parent which tends to weaken the nervous system in the child may act as a predisposing cause. Thus we have tubercle, syphilis, intemperance, extreme age, or neurosis on the part of the father, as an efficient predisposing influence.

As regards exciting causes we may have excessive anxiety or worry, excessive work, excessive indulgence in tea, tobacco, or alcohol. Excessive muscular exercise, especially in men not accustomed to it, is a not infrequent cause, and I have seen several cases of neurasthenia which followed courses of athletics at a much advertised school.

One of the commonest causes of neurasthenia at the present time is epidemic influenza, and it may also follow convalescence from most other acute illnesses. In fact any organic disease or functional disturbance which can lead to exhaustion of the nervous system may act as the exciting cause of this condition in persons predisposed to it.

The condition known as neurasthenia appears to consist essentially of a defect in the metabolic processes of the

body, the mechanism by which this is produced being complex and probably varying in different cases. In fact there is no one disease which may be rightly termed neurasthenia, but many neurasthenic conditions. In all cases there is probably either a poisoning of the nervous mechanism or protoplasm of the cells of which the body is built up, by substances originating within the body or introduced from without, or there is an exhaustion of the same tissues by over-stimulation or by defective supplies of nutriment.

The vital processes of the cell, as far as we know, depend upon two things—a due supply of nervous energy and a proper amount of normal nutritive substance. When either of these are deficient, the work of the cell will be improperly performed, with the inevitable result that the products of metabolism will be abnormal and in many cases of a poisonous nature. It is easy to understand that these may act upon the cell or its nerve mechanism and further impede its work, thus setting up a vicious circle of disease; or being carried into the general circulation, produce symptoms by acting upon nerve tissue or upon secreting or muscle cells at a distance. We may set forth the causes of neurasthenia in a tabular form somewhat as follows:—

First stage of neurasthenia.—This is the result of one or more of the following conditions:—

(*a*) Defective nutrition of the cells or their nerve mechanism from general conditions, such as anæmia or phthisis;

Defective supply of food to the body, resulting in degrees of starvation;

Defective digestion or assimilation of food.

(*b*) Poisoning of the cells or of their nerve mechanism by poisons introduced into the system from without, such as tea, tobacco, alcohol, morphia, cocaine;

Toxines absorbed from the mouth, stomach, intestines, or uterus;

Poisons generated within the tissues themselves as the result of defective work of the cells.

(*c*) Exhaustion of the protoplasm of the cells of the body from continual over-stimulation.

(*d*) Exhaustion of the nerve mechanism of the cells from over-stimulation.

Second stage of neurasthenia.—As the immediate effect of any of the foregoing causes we get defective work of cells, and in consequence the chemical changes in the tissues themselves are imperfectly carried out, with the result of the production of toxines.

The next step is the further poisoning of the cells by these nitrogenous substances which have undergone imperfect metabolism, and the production as a direct consequence of neurasthenia, gout and other allied conditions.

In short we may regard neurasthenia as a pathological exhaustion of the neurones due either to poisoning in the ways mentioned or to exhaustion produced by the habits of the patient, who has worn out his nervous system by overzeal in some direction or other.

As regards the mechanism by which neurasthenia produces digestive troubles, the symptoms may be directly due to a hypersensitive condition of the sensory nerves, to defective work in the secreting cells, or to deficient innervation of the muscular substance.

Characteristic symptoms or stigmata of the neurasthenic condition.

"Contrary to our experience in many other nervous diseases, the patient presents no striking physical peculiarities. There are none of those obvious features that so often enable us at a glance to relegate a given case to this or that group of diseases. Frequently it is only after our patient begins to talk that we gain an idea of the character of his affection. He begins by telling us how he feels, and we soon become

impressed with the subjective character of many of the symptoms. The patient is rarely talkative. Only after repeated questioning we learn that he is 'nervous'; that he easily gets excited and 'upset'; that he can no longer work as he did, that he gets tired before the day is half over; that he can hardly sleep at night; that when he awakes in the morning he feels completely exhausted; that his head aches; that his heart palpitates; that his memory is impaired; that he has to force himself to eat; that his food lies heavy upon his stomach; that his bowels are constipated; and so on through a long train of distressing symptoms."[1]

As a matter of fact the symptoms are motor, sensory, mental, and visceral, and are worthy of careful study.

Motor symptoms.—The main fact at the bottom of all the motor symptoms is that muscular fatigue ensues much quicker than it normally should. The muscular power of the patient is thereby lessened in the aggregate without there being any true paralysis. At the commencement of muscular exertion his power may be nearly up to normal, but this quickly declines, until at the end of a long examination he may be unable to exert more than half the force as measured with the dynamometer which he exhibited at the commencement. In consequence the patient complains of muscular fatigue and of pains in different parts of the body coming on shortly after exercise has been commenced. There appears to be no wasting and no electrical change in the affected muscles. There is merely the fact that the sensation of fatigue appears quicker and lasts longer.

A phenomenon which is constantly present in neurasthenics is a jerking of groups of fibres in the muscles. This is a common experience to all of us in the twittering of fibres of the orbicularis muscle of the eye, popularly called "live blood". In neurasthenia the condition is exaggerated and may appear in any of the muscles of the body, even in large

[1] Dercum, *Text-book on Nervous Diseases*, p 56. London, 1895

ones such as the rectus, and may annoy the patient very much.

Sensory symptoms.—The neurasthenic never feels quite well, and always has some vague or abnormal sensation somewhere. Pain in the head, tingling, twitching, or crawling, sensations of heat or burning or cold; sensation of a band round the head or arm or leg, or weight in a foot or leg, or drawing or contraction round the mouth. All these may render the life of the neurasthenic a misery. Back-ache, numb sensations, or areas abnormally sensitive. Spots upon the trunk especially sensitive to pressure. Fatigue symptoms in the eye causing dimness of sight or ocular distress after working for a time. Sudden blurring of the sight. All these are common symptoms.

Mental symptoms.—In the first place there is lessened power for mental work. This is due to the fact that the brain is easily fatigued in the same manner as the muscles. Resulting from this comes loss of the power of mental concentration. The patient is unable to keep his attention fixed upon one point for any length of time as unconscious fatigue ensues. Consequently memory is defective, as the integrity of this function depends entirely upon the depth of the impression. If the mind wanders the impression is weak and memory is consequently imperfect. Will-power is lessened, and the patient becomes undecided, weak, and vacillating. A symptom which causes a great deal of distress to some neurasthenics is an undefined sense of misery in the head. This sensation it is impossible to describe, but it produces the greatest discomfort and apprehension. The patient may be feeling quite well, when he will be suddenly seized with an undefined feeling, perhaps of horror or fright or of intense nervousness. He is often afraid lest he should have an impulse to injure himself or others, which he might not be able to resist, and in extreme cases he will remove all

ropes or poisons from the house, and will give up shaving lest he should be driven to kill himself with the razor. He has no impulse to suicide, and does not want to, but he is mortally afraid lest he should have a sudden self-destructive impulse so strong that he would be unable to resist it. The very thought makes him sweat with terror. The sense of misery in the head leads him to imagine that he is going out of his mind. Some patients are seized suddenly with a feeling of panic, often associated with a sensation of sinking referred to the pit of the stomach, particularly if away from home alone. Others are always taken ill if they should happen to be in a place from which they cannot get immediate egress, such as a theatre or church, or an express train. In consequence they either give up going to the theatre altogether, or manage to sit next the door. Many people have not been to church for years from this reason. This I am convinced is one of the commonest manifestations of neurasthenia, and as my readers are all aware, has been termed claustrophobia.

The mere reading an account in the paper of a murder will "give the patient a turn" and set up the sense of misery or fright.

In other cases the trouble is a thought or idea which haunts the mind, and cannot be got rid of, such an idea being termed by neurologists an imperative conception and causing much distress. As an example I may cite the following interesting case:—

Miss P., *æt.* about twenty-eight, who had been out of health for some time and had suffered from various neurasthenic symptoms, was brought to me complaining of a continual sense of acute misery produced by the following train of thought. It happened that she had stepped in a little saliva on the pavement, and she was now haunted by the thought that this sputum might have been tuberculous and that she might have carried it into some house and have

infected someone. Of course the whole idea was absurd, and she was herself convinced of its folly, but nevertheless the idea constantly recurred and produced great distress. Unfortunately the patient, who had a bad family history, eventually became melancholic and curiously enough died of phthisis.

Many neurasthenics always carry a flask of spirit in their pocket in case they might be taken ill. They have it always with them but never use it. If by chance they should forget it and leave it at home they are very likely to have an attack of panic.

The effect of general neurasthenia upon the stomach may be to produce a single neurosis, or a combination of two or more neuroses. To the latter condition in certain combinations we give the name nervous indigestion or gastric neurasthenia. As a clear understanding of the several gastric neuroses is necessary for a perfect understanding of nervous indigestion, we will take the commonest of them in succession and mention their salient points.

A. Neuroses depending upon paresis of gastric motor nerves.

Paresis of the muscular wall of the stomach.—This condition, which is a rare one, is occasionally met with in practice and produces acute dilatation of the stomach. Its pathology is at present unknown and is probably due in most cases to some form of intoxication, although occasionally it undoubtedly occurs reflexly. For instance, I have seen a case which was caused by the passage of a gall-stone. It occasionally complicates hysteria, and is sometimes the result of traumatism.

This condition must be distinguished from atony of the stomach wall. In atony the elasticity and tone of the stomach muscle itself is defective. In paresis the contractility is temporarily abolished from defective innervation.

Pyloric insufficiency.—If some carbonic acid gas is set free in a normal stomach by the effervescence of a mixture of alkali and acid, or if some air be blown in through a tube, the organ will be distended, and this condition will remain for at least a few minutes. In certain cases it is found that it is practically impossible to inflate the stomach, as the air or gas which should do so, escapes through the pylorus as fast as it is introduced. The pylorus under these circumstances is said to be insufficient or incontinent. This condition is met with either as the result of organic changes such as cancer or ulcer, which may mechanically prevent proper closure of the pylorus, or from deficient innervation of the muscular pyloric ring. We have in the latter case a form of pyloric insufficiency which is a pure neurosis, and has been met with in compression-myelitis, hysteria, and neurasthenia. I am convinced that this condition is much more common than is generally supposed, and that it is an unrecognized cause of many of those cases of extreme flatulence in which, in the absence of abnormal fermentation, gas suddenly accumulates in the stomach. In these cases I believe that the gas, which is formed by the decomposition of the alkaline succus entericus by the acid chyme, regurgitates from the duodenum into the stomach and distends it.

B. Neuroses depending upon hyper-excitability of the gastric motor nerves.

Nervous eructation.—We are all familiar with the wind which is brought up not only as the result of fermentation, but even in healthy people. Some air is always swallowed with the food, some arises as the result of the decomposition of the alkalies present in the food, and some is given off by effervescing beverages which have been consumed. All this is brought up as a natural result of the normal contractility of the stomach. But apart from this normal belch-

ing, in certain neurasthenic and hysterical cases eructation of gas occurs when the stomach is empty, and may assume such importance as to become a serious source of trouble to the patient. Nervous eructation of this kind has certain well-marked characteristics. In the first place there may be no signs whatever of digestive disturbance. There may be no retention of food residues, and the composition of the gastric juice after a test meal may be perfectly normal. In the second place the quantity of gas which is brought up may be very large and developed quite suddenly. The noise is often short and explosive, and the act of belching may be repeated several times in a minute. It may be excited by any emotion, and may appear and disappear suddenly. Undoubtedly some of these cases may be accounted for by pyloric incontinence, but in many patients in whom I have observed this symptom the pylorus has been proved to be perfectly normal.

Spasm of the pylorus and cardia.—These conditions usually occur simultaneously, and are the cause of great distress to the patient, producing the condition known as pneumatosis, in which the stomach becomes painfully distended with gas, which can be passed neither up nor down. Pyloric spasm is usually reflex, and due to the irritation of abnormally acid stomach contents, which are thus prevented from leaving the stomach. But in neurasthenia it not unfrequently occurs when the stomach is empty, and in combination with excessive formation of gas forcibly distends the stomach, often producing dyspnœa from pressure upon the diaphragm, attended by faintness and palpitation from interference with the innervation of the heart.

Regurgitation.—This phenomenon occurs chiefly in hysteria and neurasthenia, and is often a prelude to nervous vomiting. The fluid regurgitated may be bitter or acid, or it may be without taste or smell. In the latter case it is sometimes swallowed again. Long-continued

regurgitation may pass into the more severe affection—rumination.

Rumination.—This is precisely analogous to rumination in animals. Boluses of semi-digested food are brought up into the mouth without nausea or effort, submitted to a second process of mastication, and again swallowed. It is a very rare complaint, and appears to be chiefly met with in cases of hysteria.

Peristaltic unrest.—This is a morbid condition in which the patient is conscious of the peristaltic movements of the stomach. Quite apart from the exaggerated peristaltic movements met with in pyloric obstruction, it is frequently met with as a pure neurosis, and is a source of considerable distress to the patient.

Nervous vomiting.—This neurosis we may divide into two classes—those which are evidently reflex, and those in which a source of irritation cannot be discovered. Vomiting belonging to the latter group is common in hysteria, rare in neurasthenia. It is a peculiarity of neurasthenic and hysterical vomiting that it is rarely accompanied with a feeling of nausea, and the food is brought up without much retching.

C. Neuroses of sensation.

Under this heading we may place the different abnormalities in the appetite—bulimia, polyphagia, perversion, and the nervous anorexia already alluded to. To these we must add gastric hyperæsthesia and gastralgia.

Hyperæsthesia of the gastric mucous membrane.—This is not by any means an uncommon condition, and is chiefly observed in neurasthenia and in chlorosis and anæmia in girls. It is considered to be either a pure neurosis or to be associated with a lesion of the central nervous system. It has been observed in locomotor ataxy and cerebral tumour, and is common in neurasthenia, hysteria, and chlorosis.

In the last affection it often leads the physician to make an erroneous diagnosis of ulcer.

In its mildest form a feeling of weight or fulness is experienced after food, often accompanied with a sinking sensation, nausea, or slight vertigo. In more pronounced cases the stomach is unable to tolerate any food at all, and vomiting occurs directly after a meal. Occasionally this takes place before the meal is finished. In these cases it is not unusual for severe pain to be experienced. The appetite is capricious. Patients are often very hungry, but dare not satisfy their hunger for fear of the pain which they anticipate.

It is not always easy to make an absolute diagnosis. The chief affections from which it has to be distinguished are ulcer and gastralgia. At first sight it would appear that ulcer might easily be mistaken for it, since both affections are common in chlorotic girls, and are characterized by pain. Moreover, ulcer is not invariably accompanied by hæmorrhage. But there are differences which should enable us to distinguish between them.

In ulcer the pain is usually more violent, and is more circumscribed in its area. It depends also very much upon the composition of the meal, which is not the case in gastric hyperæsthesia pure and simple. But the most important point is the chemical examination of the stomach contents. In gastric hyperæsthesia we usually obtain normal gastric juice secreted during the digestive periods only. In ulcer we invariably find hypersecretion, provided that the general health of the patient has not yet undergone marked deterioration, and very often "occult" blood.

Gastralgia.—This is nothing more nor less than a paroxysmal neuralgia of the sensory nerves of the stomach.

It is usually preceded by nausea, epigastric fulness, salivation, or other prodromata. The seat of pain is in the epigastric and left hypochondriac regions, from which

points it may radiate in all directions. The pain is often accompanied by a sense of constriction at the lower part of the chest, also by a sensation of burning and by pyrosis. The pain may vary much in degree. It may be so slight as to cause merely discomfort, or it may be of such extreme severity that the patient is bent almost double, and fears to breathe, cough, or speak. The paroxysm occurs quite independently of food, and shares with hyperchlorhydria and hypersecretion the characteristic that it is in many cases relieved by taking it.

In making a diagnosis we must bear in mind that there are clinically two varieties of gastralgia, which vary chiefly in severity:—

1. A comparatively mild gastralgia, with attacks of short duration. This is usually neurasthenic or hysterical.

2. A much severer form, with longer and more intense attacks. This is usually associated either with tabes or with a primary affection of the stomach.

D. Neuroses of secretion.

Until very recently all cases of primary hyperchlorhydria and hypersecretion were classed among neuroses of secretion, but it has now been well established that in many cases they are derangements of function depending on purely local causes such as hyperæmia, proliferation of glands, or atrophic conditions. Nevertheless we find these conditions of abnormal secretion occurring as pure neuroses, especially in neurasthenic conditions, and as such they will well repay study.

We may divide the neuroses of secretion into groups identical with those into which the functional disorders due to local causes are arranged.

Thus we shall find hyperchlorhydria, hypersecretion, hyperchylia on the one hand, and hypochlorhydria, anachlorhydria, hypochylia, and achylia on the other.

E. Vaso-motor neuroses.

The trend of evidence appears to point to the fact that a large proportion of the digestive troubles of neurasthenics may be due to abnormalities in the vaso-motor nerves controlling the circulation in the abdomen. One of the functions of the splanchnic nerves, as we know, is to prevent the gravitation of blood into the splanchnic veins by regulating the quantity of blood which flows into them. We can thus quite understand that serious disturbances of the circulation in the abdomen may be produced by a condition which may be termed "splanchnic neurasthenia". The subject is at present obscure and has not yet been completely worked out. That in many neurasthenics there is a condition of vaso-motor paralysis is proved by the frequency with which we meet with skins upon which red lines follow a sharp stroke with a pencil or finger-nail.

Having now passed briefly in review some of the most important neuroses of the stomach, we can proceed to study the manner in which they are usually associated to form the very well known nervous indigestion.

NERVOUS INDIGESTION OR GASTRO-INTESTINAL NEURASTHENIA.

Gastric neurasthenia may be defined as an affection of the stomach of nerve origin, accompanied by an indigestion resembling very much the flatulent dyspepsia of chronic gastritis. It is evidently due to abnormality of function in the nerves which preside over the stomach and intestines, more than two-thirds of all the cases of this complaint met with in practice being part of a general neurasthenia.

We can distinguish clinically two forms of gastro-intestinal neurasthenia—a mild and a severe one. These differ from each other mainly in the severity of the symptoms and from the fact that in the former the patient keeps his weight

whilst in the latter he emaciates. They are, however, sufficiently distinct in their clinical aspects as to merit separate descriptions.

As the result of a lengthened experience, I think that for academic purposes the most convenient classification of our cases of gastro-intestinal neurasthenia will be as follows :—

1. Cases in which the symptoms are merely subjective, and in which we find the composition of the gastric secretion to be normal and that the motor functions are adequately performed.

2. Cases in which there is some real disturbance of function, such as hyperchlorhydria or anachlorhydria, apparently not the result of conditions of local irritation or anatomical disease.

3. Cases marked by extreme flatulence and belching, but with no evidence of motor or secretory troubles.

4. Cases marked by intestinal neuroses.

Clinically, as I have said, we shall not go very far wrong if we divide our cases into two groups only—mild and severe. The salient points respectively are as follows :—

The mild form of gastric neurasthenia.—The patient manages to digest enough food to keep himself in health, notwithstanding that he possibly suffers pretty severely during the digestive period. The appetite is usually variable. The tongue is moist and clean, sometimes slightly coated at the back and sides; often flabby, with indented edges. There is often discomfort, or even actual pain, directly the food has been swallowed. The gastric nerves are hypersensitive, and feel painfully the impression of food, which in health should produce no sensation. The kind of food appears neither to influence the character of the discomfort nor the time when it makes its appearance. It has often been observed that articles of food which will not agree one day will be per-

fectly tolerated on the next. In a certain number of cases the pain or discomfort comes on some time after food. Here it is probably due to a hyperchlorhydria of purely nerve origin. Very often the pain does not come on until the stomach is nearly empty, and is relieved by taking food, being then probably the result of slight continuous hypersecretion. Many patients feel at their best for a short time after a meal. In fact, most neurasthenics do not feel equal to anything until after lunch. The local discomfort is sometimes a real pain, more often a sensation of weight or swelling in the hypochondriac or epigastric regions.

The stomach usually contains a good deal of wind, but there is not real dilatation. The atonic muscular wall of the stomach not only allows the accumulation of gas, but also *gives* a little under the weight of the contained food, and sinks towards the umbilicus. The splashing sound can therefore usually be obtained during the greater part of the digestive period. Towards the middle of digestion the patient usually commences to bring up wind, each eructation giving a little temporary relief. This gas is air which has been swallowed, and not the result of fermentation. Neurasthenics often suffer during digestion from flushes of heat, drowsiness, lassitude, inability for mental work, palpitation of the heart, and occasionally throbbing in the head. These symptoms are either reflex or are due to the absorption of toxines formed during digestion. After digestion has been completed, the patient may still suffer from certain uneasy sensations, such as sinking, dragging, hunger, uneasy sensations in the head, and slight vertigo. In a great many cases of gastric neurasthenia the symptoms are mainly local and the whole affection may be summed up in the fact that the patient is conscious that he has a stomach.

There are usually painful pressure spots somewhere between the umbilicus and xyphoid cartilage. As a rule, motility is impaired, and there is diminution of hydrochloric

acid in the gastric juice. In other cases there is hyperchlorhydria or hypersecretion.

The severe form of gastric neurasthenia.—Here we find practically the same symptoms as in the milder form, but more pronounced. There is greater pain, more frequent eructation, and constipation of a more troublesome character. In addition we have the progressive emaciation of the patient. In this complaint we have combined a severe neurosis of motility of the stomach, associated with deficient acidity and deficient absorption both from stomach and intestine. In one case recently under my care the free acid of the gastric juice was only 0·2 per 1,000 two and a half hours after a meal. The reaction with the salol test was 200 minutes; with the iodide capsule, 30 minutes; and with Gunzberg's capsule, 135 minutes.

It is probable that in most cases the nerves which preside over the functions of the intestine, pancreas, and liver are gravely affected. Thus the fats and starches of our food are not acted upon, and constipation is pronounced. In cases of long duration real lesions of the digestive organs are produced. First comes myasthenia, then dilatation of the stomach; following this, abnormal gastric fermentations and chronic gastritis. In this grave form of gastric neurasthenia there is a great tendency for a vicious circle of disease to be set up. The imperfect elaboration and absorption of the food, the result of gastric neurasthenia, further impoverishes the nervous system, and thus perpetuates, even if it does not increase, the neurosis.

It is in this grave form of neurasthenia that neuroses of the intestine are so frequently met with, the commonest condition being mucous colitis, which, according to some authorities, occurs as often as in eighty per cent. of all neurasthenic women. It is a condition characterized by constipation, the passage of masses of glairy mucus, and in many cases attacks of colic. This affection, although called colitis, is

a neurosis simply, and must be distinguished from muco-membranous colitis, which is a neurosis of secretion, but accompanied by a chronic inflammatory condition of the colon, and marked by the passage in addition to the mucus of shreds of membranes. The pain of the two affections is so distinctive that it is often possible to differentiate them by this symptom alone. In mucous colitis the pain is usually of the nature of colic, and ordinarily comes on after a period of constipation. It is not localized to any particular part of the abdomen. In muco-membranous colitis, on the other hand, the pain or discomfort is heavy, dull, and persistent, and is felt usually in the left iliac region over the site of the descending colon.

The exact relationship which obtains between neurasthenia and gastroptosis has not yet been quite worked out. Glenard, to whose work we owe our earliest knowledge of the subject, believed that neurasthenia was in many cases the result of enteroptosis. On the other hand, this connection has been denied, from the fact that many persons suffering from gastroptosis and enteroptosis exhibit no neurasthenic symptoms.

More lately, Stiller has drawn attention to the occurrence in neurasthenia of a floating tenth rib in combination with gastroptosis, and asserts that both these latter are symptoms of the neurasthenia and denote a congenital universal asthenia.[1] Kemp, of New York, as the result of a series of investigations made with the diaphane, believes that gastroptosis is the most frequent cause of mucous colitis.

My own opinion at present is that gastroptosis is a result or concomitant of neurasthenia, and that once having occurred it undoubtedly in many cases sets up symptoms of its own. These are produced—

(*a*) By dragging on the attachments of the stomach, and thus directly producing pain.

[1] Stiller, *Arch. f. Verdauungs-Krankheiten*, Band VII., p. 275

(*b*) By kinking the pylorus, with resulting partial obstruction and eventual motor insufficiency.

The pain of gastroptosis is characteristic, being absent on rising in the morning, and growing worse as the day progresses. It can usually be promptly relieved by an appropriate belt or bandage.

Gastroptosis is often associated, as we all know, with a floating kidney, and should always be looked for when we find one.

Diagnosis of gastric neurasthenia.

In practice the main difficulty will arise when we find marked alterations in the muscular power of the stomach or in the composition of the gastric juice associated with neurasthenic symptoms. In such a case the diagnosis will depend upon what answer we can give to the following questions:—

(*a*) Is the local trouble the primary disease and the neurasthenia merely a concomitant possibly owning a common origin?

(*b*) Is the local trouble a manifestation of neurasthenia?

(*c*) Or has the neurasthenia been caused by the local gastric condition?

In the elucidation of such a case we shall be aided by the following considerations:—

1. In gastro-intestinal neurasthenia any myasthenia of the stomach present will probably be of the first degree.—That is to say, it will only be a loss of contractility unaccompanied by any retention of food. Anything beyond this will point to primary atony of the stomach. If therefore in any case we find food residues six hours after a meal or before breakfast, in association with the characteristic symptoms of neurasthenia, we must usually regard the case as one of primary gastric myasthenia, with secondary nervous troubles.

2. If the muscular atony is of the first degree, and varies

from day to day, the trouble is probably neurasthenia.—If of the second or third degree (retention myasthenia) the affection from which the patient suffers will most likely be primary myasthenia or the early stage of progressive pyloric stenosis in which compensation has been temporarily regained by attention to diet.

3. In neurasthenia any abnormalities in the gastric juice, even achylia, will most probably vary from day to day.—In primary local affections, deficiency in the gastric juice will remain constant, and excess will invariably follow the same stimulus.

4. In primary affections of the stomach the symptoms will vary directly as the digestibility of the food.—Coarse or indigestible food will be invariably followed by symptoms, whilst bland and well-comminuted articles of diet may be consumed with comfort. In neurasthenia there will be no constant rule, the effect produced by the same kinds of food varying from day to day.

5. In neurasthenia the severity of the symptoms will vary from day to day according to the general state of health of the patient.

6. In neurasthenia the subjective symptoms are out of all proportion to the actual disturbance of the digestive process as determined by physical examination.

7. The length of time during which the disease has continued without marked progress may afford us valuable information, as organic and anatomical affections tend to increase as time goes on, whilst the purely neurotic may undergo no perceptible change.

8. The atony of the stomach occurring in neurasthenia may be distinguished from primary gastric myasthenia from the fact that it is merely a fatigue symptom and not a permanent condition.—It will thus rarely be severe and will vary in degree according to the condition of the patient's nervous system.

9. True myasthenia of a severe form, that is of the second or third degree, is very rarely associated with neurasthenia. —It is true that in the last stage of myasthenia we may find nervous symptoms as the result of the long-continued malnutrition of the patient, but this is not a true neurasthenic condition. It is therefore probably quite wrong to say, as many writers upon diseases of the stomach assert, that the atony of the stomach is primary and produces the neurasthenia. Atony is, as we have seen, often the first symptom of neurasthenia, and in these cases some of the other stigmata of this affection can be found if we look for them carefully. The reason why they are often overlooked is that patients come complaining about their stomachs and quite omit to mention their other symptoms. If taxed with this their answer is that they thought that all their other symptoms proceeded from the stomach and would get well when their digestion improved, and consequently there was no need to mention them.

I think that it is an undoubted fact that in practice many cases are erroneously diagnosed as nervous indigestion when there is really some definite physical condition present as an explanation of the symptoms of the patient. Apropos of this I will quote the following extract from Boardman Reed:[1] "Nervous dyspepsia may ultimately cease to be classed as a distinct type of disease when our methods of diagnosis shall have become more perfect." And again: "The fewest cases of it are encountered now by the men who are most expert and painstaking in their examination."[1]

As an example of the mistakes made in practice from want of care in examination, or more probably from a lack of acquaintance with modern methods, I will cite from my note-book a few cases which have recently been sent to me as examples of nervous indigestion.

Mr. M., *æt.* twenty-six, consulted me in October, 1904,

[1] Boardman Reed, *Diseases of the Stomach and Intestines*, p. 871

for attacks of vomiting. The patient had been athletic as a boy and had suffered from attacks of constipation since very early in life and had often passed a considerable quantity of mucus in his stools. His present troubles commenced in August, 1898, when he had his first attack of vomiting, which followed upon a short period of malaise and general "seediness". On this occasion he vomited twice. He went up to Oxford in October, 1898, and from the first was troubled with a considerable degree of constipation, there being only one or two actions a week unless he took opening medicine. Whilst at Oxford he only vomited several times at long intervals, each attack being preceded by a few days of loss of appetite and feeling out of sorts. Since leaving Oxford has gradually become worse until he has finally had eleven or twelve attacks of vomiting during the last few days. About a year ago he consulted one of the titled heads of the profession, who told him (apparently without examining either the motility or the secretions of the stomach) that he was suffering from nervous indigestion and that he must "grin and bear it". *Symptoms:* He invariably experiences a sensation of sinking before a meal, which will be followed by vomiting. Vomiting follows about two hours after the meal. *Objective:* Food residues are present six hours after a mixed meal, showing A=85, H=50. The gastro-diaphane shows marked dilatation. *Diagnosis:* Continuous hypersecretion. Myasthenia of the second degree. *Treatment:* Intragastric application of the triphase alternating current, intragastric spray of nitrate of silver. Regular morning lavage. *Result:* After three months' treatment neither residues nor HCl are to be found in the stomach six hours after a meal and no vomiting has occurred after the first three weeks.

Of course in a well-marked case of such a simple nature as the one which I have just narrated there could be absolutely no excuse for a wrong diagnosis. Not only were the

characteristic stigmata of neurasthenia conspicuous by their absence, but the sinking before the meal, so often met with as a symptom in hypersecretion, in combination with the vomiting after food should have aroused suspicion and have pointed very clearly to the necessity for a proper examination of the contents of the stomach after a test meal.

Mr. H. was sent me for an opinion on November 10th, 1904. The patient, aged fifty-four, had suffered since the age of twenty years with his stomach, the symptoms consisting of attacks of pain after meals lasting for a few days and then being succeeded by a period of health until another attack came on. Latterly the attacks have been more severe, a curious point being that he is almost free from them during the warm weather, but during the winter they are more or less continuous. *Present symptoms* consist of pain after meals so severe as to compel him to stop work, nausea, belching, and epigastric fulness. He has vomited three times altogether during the last week. His appetite is good and his bowels are only kept open by laxatives. *Objective:* The fasting stomach contains about three ounces of a dirty yellowish liquid containing residues of undigested bread and showing a total acidity of 40 with 30 free hydrochloric acid. By transillumination and inflation the stomach is found to be greatly ptosed, the lesser curvature being below the umbilicus and the lower border within an inch of Poupard's ligament. *Diagnosis* is therefore gastroptosis, with continuous hypersecretion and gastric motor insufficiency. In this case we see the diagnosis established by a few simple tests not taking ten minutes altogether to carry out. From the history of the case it is probable that the attacks from which he first suffered were simple hyperchlorhydria. The pathology of the case is simple, the stomach working at a mechanical disadvantage. *Treatment:* Lavage. Rose's plaster belt. Triphase sinusoidal current. *Result*. Patient is improving.

Dr. L. consulted me on October 24th, 1904. He is thirty-two years of age and has enjoyed good health until last November, when he had a nervous breakdown occasioned by overwork, smoking, and late hours. His case had been diagnosed as neurasthenia by Sir ——, who had, however, made no intragastric examination! His first symptoms consisted of pain in the epigastrium and left hypochondrium coming on about 3 a.m., which shortly passed away and allowed him to go to sleep again. Later on he used to have it at odd times during the day with no time relation to food. It was always relieved by alkalies. His weight fell from 11 stone to 9.10, but in the last two months it has again risen to 10.8. *Symptoms*. Suffers from bad frontal headaches apparently coinciding with his stomach troubles. Has now very little actual pain, but weight and burning at the pit of the stomach. Belching slight. Appetite good. *Objective:* Fasting stomach is empty. Transillumination reveals a gastroptosis, the lesser curvature being below the umbilicus. Stomach contains food residues seven hours after a mixed meal, but not before breakfast. Food residues show A = 60, H = 30. *Diagnosis:* Gastroptosis. Moderate motor insufficiency. Continuous hypersecretion. *Treatment:* Plaster belt. Triphase sinusoidal current by external electrodes. Lavage. *Result:* Great relief. Patient is still under treatment and progressing steadily towards recovery.

Miss B., *æt.* thirty-eight, was sent to me on January 19th, 1903, by Dr. S. as a case of gastric neurasthenia. She had suffered from epidemic influenza on four occasions during the last seven years. *Symptoms:* Pain before meals generally relieved by food, also coming on very often an hour or so afterwards. Considerable flatulence and belching. Obstinate constipation. Sinking feeling at the pit of the stomach. Various morbid fears. Is easily tired. *Objective:* Food residues in the stomach six hours after a mixed meal. No free HCl. After Ewald test breakfast, A = 100, H = 40.

Lower border of stomach level with umbilicus. Lesser curvature cannot be made out. *Diagnosis:* Myasthenia of second degree. No gastroptosis or dilatation. Associated neurasthenia. *Treatment:* Abdominal belt. Lavage. Constant current. Nux vomica. Aloin. *Result:* After three months' treatment food residues no longer present six hours after a meal. No pain or other symptoms.

Treatment of gastric neurasthenia

Diet in gastric neurasthenia.—Gastric neurasthenia, as we have seen, is usually a neurosis pure and simple, and is not accompanied as a rule with any abnormality of the secretion or muscular insufficiency sufficient to indicate any modification of the diet. When either of these conditions are present the diet appropriate to the neurasthenia will have to be modified in the manner described under the headings muscular insufficiency, hyperchlorhydria, and hypochlorhydria respectively.

We may take it that with very few exceptions the cases of atonic or functional dyspepsia which we meet with in practice at the present day, although depending, as we have seen, in the first instance upon want of nerve tone or to nerve poisoning by absorbed toxines, alcohol, or tobacco, are really more complicated than they at first appear to be. As an example we will take a case in which defective innervation of the digestive apparatus leads to imperfect digestion and in consequence to defective asssimilation of nutriment. The body is as a natural consequence imperfectly nourished. The important point to bear in mind is that the nervous system must participate in the general malnutrition, and reacting again upon the stomach perpetuates the dyspepsia. Thus is set up a vicious circle of disease which is difficult to break. It is obvious that we cannot hope to cure a case of this kind by further restricting a diet which the patient has himself curtailed in all probability by volun-

tarily leaving off everything which he has found to disagree with him. Rather we should suggest that the patient make a point of taking everything which he has on one occasion found to agree.

In cases like these, where the trouble is mainly one of sensation, where the patient is morbidly conscious of the digestive process, we should try and induce him to take as much nourishment as possible whether it produces discomfort or not. It is therefore almost impossible to prescribe a strict diet table. Rather administer food according to the following rules :—

Do not restrict the diet beyond avoiding articles of food which common sense tells us are palpably indigestible. If it is found that any article of diet of ordinary digestibility disagrees, do not cut it off entirely, but merely restrict its quantity, and see that the patient masticates it more than usual. This is important, as the stomach by disuse may, so to speak, forget how to deal with any article of diet upon a future occasion.

Whilst avoiding highly seasoned and smoked food, we must not allow the diet to become too monotonous or the diet will surely fail. Bearing in mind the investigations of Pawlow (see p. 10) that the quality of the gastric juice secreted depends very much upon the sapidity of the food introduced into the mouth, we must tempt our patient to eat by giving him delicately prepared and dainty dishes. But above all things we must avoid giving food which is too digestible. Most of our patients will be suffering from constipation, and bland unirritating food, carefully freed from cellulose and animal and vegetable connective tissue, is not sufficiently stimulating to the alimentary canal to cause a daily evacuation of the bowels. The following rules attempt to codify these principles :—

1. The food must be nutritious and plainly cooked.
2. It must be given at comparatively short intervals, as

the strength of the patient requires to be sustained. A raw egg beaten up with a little milk and a teaspoonful of old brandy may often be given with great advantage between breakfast and lunch and between lunch and dinner.

3. The inclination of the patient must be consulted as to the precise articles of diet to be given. It will often be found that the food patients fancy will frequently agree if they are allowed to take it at the time they fancy it. Nature is not such an unreliable guide if her dictates are obeyed with discrimination.

4. The patient should take as much fat as possible in a digestible form. Fresh butter well rubbed into thin slices of stale bread, or cold boiled fat bacon will usually agree.

5. The amount of fresh meat should be increased.

6. The amount of starch as a rule requires to be curtailed.

In short the diet, whilst being bland and easily digested, should contain proteid material in abundance, mutton, beef, pigeons, sweetbread, eggs, and milk being taken as the basis. Fat should be given in as large quantity as can be absorbed, being preferably administered in the form of fresh or slightly salted butter. Sugar should be taken only in small quantity, whilst alcohol, coffee, tea, vinegar, and condiments forbidden.

These are the main features of the diet, but they will have to be modified to suit the particular gastric condition which is present.

Modifications in the diet may be necessitated in any particular case either by loss of tone of the muscular wall of the stomach or by excess or deficiency of hydrochloric acid and ferments in the gastric juice.

We will first of all take *want of muscular tone*. This is almost invariably present in cases of neurasthenia to some extent, but fortunately usually only in a mild degree. When this is the case we shall not require to alter the number of

meals, but give the four or five small ones which, as we have seen, are most suitable for neurasthenia. When, however, myasthenia of the second or third degree is present, we must diet the case according to the rules laid down in the chapter on myasthenia.

The hydrochloric acid and pepsin of the gastric juice are deficient. When this condition is present, the first thing to bear in mind is that the digestion will be necessarily prolonged, and that there will in consequence be a tendency for the food to remain longer than it should do in the stomach. And this will be the case quite independently of any myasthenia. The second point to remember is that owing to the deficiency of hydrochloric acid, the digestion of starch will not be stopped at as early period as normal, and that instead of lasting, say, half an hour, the conversion of starch into maltose will go on practically through the whole digestive period, and thirdly, the digestion of animal food will be difficult and defective. To meet these three indications we must—

(*a*) Give the food in a finely divided condition.—It will thus be able to pass out of the stomach with the minimum amount of muscular action on the part of the stomach itself.

(*b*) We must arrange a diet table consisting very largely of farinaceous constituents, as this will be well digested, and

(*c*) We must not omit to limit the amount of animal food.

In fact we should prescribe such a diet as follows:—

Breakfast.—Cold boiled bacon, toast, one egg; towards the end of the meal, one small cup of cocoa. Fresh butter *ab libitum.*

Lunch.—Any white meat, or fish or poultry or bird; green vegetables in the form of a purée; stale bread or toast. One glass of water towards the end of the meal.

Tea-time.—A cup of Mellin's food or a glass of milk and soda-water.

Dinner.—Fish; butcher's meat, roast, grilled, or boiled, especially lamb, hare, tender beef, and tripe; purée of vegetables; baked apples or stewed fruit, baked custard pudding; toast or bread. One glass of water towards the end of the meal.

If desired, a little spirit may be added to the water at lunch and dinner. The main point is to induce the patient to take a sufficient amount of easily digested fat, and to limit the amount of fluid taken with the food. An hour before any meal, the patient may take as much water as he likes to drink. No soup, entrées, nuts, cheese, or pastry, are to be allowed.

In gastric neurasthenia all food of every kind will cause discomfort, and most patients will already have reduced their diet to far below that required for the needs of the organism, in the vain attempt to find a diet upon which they can live with comfort; and naturally, in doing so, they have increased the gastric trouble, as the stomach will participate in the general tissue starvation. It is well, therefore, to explain this to the patient, and put him at once on a diet which is adequate to support life, and insist upon it being taken, however much discomfort it causes.

The recommendation to give small frequent meals in cases where the gastric juice is weakened has a scientific basis. Pawlow as the result of a series of observations found that the quantity of pepsin required to digest a given quantity of food varied directly as the square of the quantity. Thus if two gm. of food would require two parts of pepsin to digest it, then four gm. would not require four but sixteen.

We find the hydrochloric acid is in excess.—In this case we have two main indications—

1. We must give a food which has a high combining value with hydrochloric acid. We must do this to protect the stomach from the irritating effects of the excess of acid.

The pain of hyperchlorhydria is at once relieved by raw eggs or milk. But we must avoid giving such food as will excite the gastric glands to a fresh secretion of hydrochloric acid. We are therefore in rather a dilemma, as recent experiments have shown us that the stomach is very sensible, and secretes a gastric juice absolutely fitted, in quantity and quality, for the particular work it has to do. For instance, if we introduce bread into a normal stomach, a gastric juice poor in HCl and admirably fitted to digest that article of food will be secreted. If, on the other hand, we put into the stomach a mutton chop, a gastric juice rich in pepsin and containing a relative excess of HCl will be at once poured out. So that, if in a case of hyperchlorhydria we give a proteid diet, which has a high combining power for the free acid, we run the risk of stimulating a further secretion of the very substance we are attempting to neutralize. But under these circumstances we must do the best we can, and fortunately there are several food-stuffs which, whilst having a high combining value to HCl, yet stimulate the secretion of it much less than red butcher's meat. These are—sweetbreads, calves' brains, oysters, albumin of eggs, plasmon, and milk.

2. We know that HCl in excess inhibits the digestion of starch, which was begun in the mouth by the ptyalin of the saliva. It is obvious that we must—(*a*) Limit the amount of starchy food. (*b*) Convert as much of it as we can into dextrin. We toast our bread, and give converted starch, such as grape nuts or Mellin's food. (*c*) We give with the starchy food a diastatic ferment, such as malt extract (choosing the liquid ones, such as bynin), taka diastase, or simple home-made infusion of malt, as recommended by Roberts.[1]

For further details the reader is referred back to the treatment of hyperchlorhydria, p. 73.

[1] Sir Wm. Roberts, *Digestion and Diet*, p 224. London, 1891.

The treatment of gastric neurasthenia by electricity.

For the treatment of the neurasthenic condition generally we may employ static electricity, high-frequency currents, the triphase or monophase alternating current, and the continuous galvanic current. With any one of these forms of electricity good results may be obtained by a physician familiar with the technique, and also thoroughly conversant with neurasthenia.

As I have said elsewhere, there is nothing magical about electricity that it will cure however it is applied or in whatever form. Like other powerful therapeutic agencies, the proper current must be selected, the dose, duration, and frequency of the treatment determined, and the subsequent management of the case regulated by the absolute physiological effects produced as measured by the sphygmometer, sphygmograph, the estimation of the composition of the gastric and the urinary secretions, and other methods of precision. In other words, for the treatment to be successful it must be conducted, not by an electrical expert pure and simple, but by a physician well experienced in the management of neurasthenia, and who knows exactly the physiological effects which he can produce by the electrical methods he proposes to employ, and exactly what he wants to do in the case before him. It will be at once evident that the conditions under which a patient is treated by a nurse, attendant, or medical electrician, however well trained in the application of electricity, are entirely different. Such persons usually profess to work "only under the direction of a medical man". Which usually means that the medical man sends them the case and orders them to give "a course of electrical treatment", leaving to them the selection of the dose, etc. Under such circumstances failure is inevitable and unmerited discredit is thrown upon one of the most valuable therapeutic agents which we possess.

That the treatment may be successful it must be confined to real cases of neurasthenia. It is not at all unusual to meet cases wrongly diagnosed as such.

"Neurasthenia (*la maladie de Beard*) is amenable to electrical treatment provided that we do not undertake to treat as such all cases sent to us with this diagnosis. For this term has such a vague signification not only to the public but also to many medical men, that one readily gets into the habit, when pressed by the patient and his friends to give a name to a group of indifferent symptoms, of giving this diagnosis for their satisfaction.

"One has in consequence continually coming to one patients in whom neurasthenia has been wrongly diagnosed, and who have been treated hydropathically by their doctors or have been sent in succession without benefit to the sea, to the mountains, to spas, and finally in despair to the medical electrician."[1]

Treatment by static electricity.—Whenever available, treatment should be invariably inaugurated with this form of electricity, as its effects are often very rapid and striking. A large machine is not essential, as a six-plate Gaiffe or Bonetti, with 55 cm. sectorless plates, will give an output amply sufficient for the purpose. Treatment should at first be confined to the daily administration of the *static bath*, as a rule the patient being connected with the negative pole. The duration of the treatment may be five minutes at first, gradually increasing up to half an hour. The test of the dose will be found in sleep which the patient enjoys, commencing insomnia indicating that the point of toleration has been reached and that the duration of the séance must not be further prolonged.

In cases where mild degrees of myasthenia are present the best result may be obtained by the use of the Morton current,

[1] Translated from *Electricité Médical*, par Dr. H Guilleminot, p. 411. Paris, 1905

the positive pole being used as the active electrode and the negative one earthed. In these cases I usually find the best electrode to be a bare metal ball of about three inches in diameter, which is to be applied to the skin of the abdomen, the patient lying upon an ordinary uninsulated couch.

Currents of high frequency.—These are most successfully employed in cases of low arterial tension, and may be applied with equally good results in several ways.

Bipolar effluviation.—This may be given by placing the patient between two large brushes, attached respectively to the tops of two resonators or the ends of a bipolar D'Arsonval coil, or the centre of two of Dr. Guilleminot's spirals.

Condensation couch.—This should be given daily for several weeks, not exceeding a dose of 350 m.a. I am convinced that no advantage, but rather the reverse, is to be obtained from the use of the enormous currents produced by the latest form of the Gaiffe apparatus, and certainly the element of danger cannot be absent.

Triphase and monophase sinusoidal current.—Either of these will give good results, preference being given to the triphase for administration by electrodes, and the monophase by means of a water bath. In fact the sinusoidal hydro-electric bath is one of the easiest and best methods of treating neurasthenia, as it can be rigged up in the patient's house and applied either by himself or with the aid of an ordinary nurse.

The triphase alternating current finds its especial use in attacking that form of neurasthenia dependent upon involvement of the splanchnics and the large nerve plexuses in the abdomen. It is in consequence our chief stronghold in many of the cases of nervous indigestion, more particularly those accompanied by varying degrees of muscular atony.

The constant galvanic current.—Good results are constantly obtained by the use of this current scientifically applied in cases of neurasthenia. It is especially useful when applied by means of a large electrode to the solar plexus, the anode being placed upon the epigastrium and the kathode upon the lumbar region. The dose should be from 20 to 50 m.a. In the treatment of muco-membranous colitis and other intestinal complications of neurasthenia, the best results have been obtained by the use of the hydro-electric rectal douche, the constant galvanic current being employed.

The induction coil current.—As a bifluent current combined with the constant galvanic current it is second only to the Morton and the triphase sinusoidal currents in the treatment of myasthenic conditions associated with neurasthenia. By itself it is useless in the treatment of neurasthenia in the form in which it is generally available, *i.e.* that of a small coil with imperfect interrupter, usually supplied to nurses and medical electricians.[1]

Treatment of gastric neurasthenia by drugs.

A great deal may be accomplished by a scientific use of drugs in the management of gastric neurasthenia, for although by their aid alone a cure can rarely be accomplished, yet used in combination with the physical methods they are of the greatest value. One of the first indications for treatment in cases of gastric neurasthenia is to procure a daily action of the bowels. Constipation being such a constant occurrence in nervous indigestion, its management demands our best endeavours and closest study. But in doing this much caution is necessary. There is no doubt but that it is possible to do a considerable amount of mischief

[1] For further information and detailed instruction in the technique of the methods recommended the reader is referred to the Author's book, *Electrical Methods in the Treatment of the Stomach and Intestines* Siegle, London, 1905

by the indiscriminate use of strong purgatives in cases of functional dyspepsia. One may, it is true, at the commencement of a course of treatment clear out the alimentary canal, or as our predecessors in the practice of medicine would have said, cleanse the *primæ viæ*, with a good deal of advantage, but this being accomplished our object should be to produce one evacuation daily and that of a solid rather than a liquid consistency. Anyone who has had much experience in the treatment of neurasthenics must have been struck with the great exhaustion which frequently follows active purgation. Strong medicines must therefore be avoided and the smallest dose administered which will suffice to produce the desired effect. This is the whole secret of successfully treating constipation by drugs. A large dose of a purgative which will procure a complete emptying of the bowel will inevitably be followed by more or less reaction and subsequent constipation will be the result. When therefore we propose to give a laxative continuously we must—

(*a*) Give such a small dose as shall not produce a copious action, but merely an inclination to stool. The patient must be satisfied with this, and if the stool does not result, rather aid the effect of the drug by a small enema than increase it to any considerable extent.

(*b*) Select a drug such as sulphur or aloes, which acts chiefly upon the colon and rectum without irritating the stomach and upper bowels.

(*c*) Avoid any drug which is known to produce griping in the particular patient.

(*d*) Whenever there is any morbid sensibility of the stomach and bowels combine hyoscyamus or some other gentle anodyne with the laxative.

As a rule we shall find that a combination of drugs will act more efficiently than a single one, and we may with advantage add small doses of blue pill or ipecacuanha to the daily dose.

In cases where the constipation depends upon a spastic condition of the bowel we should as a rule avoid laxative medicines altogether and rely upon oil injections as recommended by Fleiner and Kussmaul.

In cases where the biliary secretion is deranged we shall find great benefit from the use of drugs which have, I am sure, mistakenly gone out of fashion, dandelion and sarsaparilla. There is, I am sorry to say, a tendency at the present day to neglect the simple vegetable materia medica in favour of the synthetic products of the laboratory, which is much to be regretted, as much can be accomplished by the use of these drugs by those who are acquainted with their properties. Dandelion, hydrastis canadensis, and chionothus all have an undoubted effect in restoring the integrity of the biliary secretion. In cases in which the intestinal secretion is deficient, chloride of ammonium is well worth a trial in doses of about fifteen grains three times a day. This drug possesses the advantage that it can be given either in combination with an alkali or with a mineral acid, as it is compatible with either.

For allaying irritability in the gastro-intestinal tract one of the most valuable drugs is nitrate of silver. It may be given in combination with small doses of quinine, extract of gentian, or of chamomile, and is best administered in one dose at bedtime.

In the management of gastric neurasthenia the bitter tonics, quinine, nux vomica, gentian, quassia, condurango, columbo and chiretta, are often useful for increasing the appetite, and appear to have also an undoubted action, although slight, in the direction of improving the muscular tone of the stomach. Of these condurango is certainly one of the best, and may conveniently be given in combination with strychnine.

As regards the so-called nerve tonics, notwithstanding the theoretical considerations which have been lately advanced

to prove that they cannot possibly exercise any useful action, I have frequently found them of undoubted benefit. In suitable cases I have seen undoubted benefit follow the use of free phosphorus, the glycerophosphates, damiana, and valerianate of zinc.

Hydropathic methods of treatment.

There is no doubt that we can do a large amount of good by hydropathic measures in cases of neurasthenia, but it is one of the branches of the medical art which must be well learnt before being used, or instead of benefiting the patient we may quite easily produce the reverse effect. All routine treatment is therefore to be deprecated, and the means we employ must be selected with reference to the precise effects which we wish to produce in the particular patient for whom we are about to prescribe it. We have in cold water a powerful agent with which to increase the metabolism of the body, and we can with higher temperatures exercise sedative action upon the nervous system. By the alternation of hot and cold water we can act energetically upon the vaso-motor system. The skill of the practitioner is shown by the intelligence with which he selects the measure calculated to produce upon his patient the precise effect which is indicated for the relief of the symptoms from which he is suffering. This scientific use of hydrotherapeutic methods is of great importance if they are to be used at all, for, as Glatz has pointed out, "nervous states which are intensified by a cold douche will be calmed by a tepid douche or sitz bath, whilst the latter will exhaust a case of nerve exhaustion which will be relieved and toned up by a cold douche of from 10° to 22° C."[1]

Water of different temperatures can be used with advantage to restore muscular and nervous tone, if we

[1] *Dyspepsie Nerveuses et Neurasthenie*, par le Docteur P Glatz, p. 246. Paris, 1898.

know how to employ it. A simple hot or cold bath will do very little in this direction, but by the use of each in alternation a remarkable effect can be produced. The primary effect of the application of hot water to the skin is to dilate the capillary vessels. This is shortly followed by contraction. If we seize the moment when the capillaries are about to contract and apply cold water we shall intensify this contraction, and exercise a distinct and permanent tonic effect. Likewise, if we immerse the whole body in cold water, we produce very little result; but if we limit the application to one part, such as the spinal column or the epigastrium, a differential effect is produced. There are several hydrotherapeutic procedures especially useful in the treatment of neurasthenia.

Ice massage of the abdomen.—This we owe to Professor Turck, as well as several other valuable methods of treatment. The patient first of all takes a hot bath at as high a temperature as he can comfortably bear. He then lies upon a flat surface, and the whole of the abdomen is rubbed and massaged with a cake of ice. The effect is a very powerful stimulation of the stomach and intestines and of the solar plexus. Instead of holding the cake of ice in the hand, the operator may place it in a rubber bag, which Professor Turck has designed especially for this purpose.

The cold abdominal douche.—This is of great use in the treatment of constipation, and one of the best methods of applying it is the following :—

The patient lies down in an ordinary bath containing enough warm water to cover the whole of the body except the abdomen. An attendant then pours from a height of two or three feet a jug of water upon the abdomen. At first this water may be tepid, but day by day the temperature must be reduced as the patient becomes accustomed to it, until it is finally icy cold. The height above the patient is also gradually increased, and also the number of jugs used.

The cold spinal douche.—The patient kneels in a tub containing a little warm water, and leans slightly forward. Jugs of cold water are poured down his back in exactly the same way as directed for the abdominal douche.

Friction with the wet towel.—This is more stimulating if the water used contains some sea-salt. If Tidman's salt be used, it should be placed in a bag of coarse muslin, and immersed in about half a gallon of water overnight. In the morning the bag is taken out, and if the weather be very cold or the patient unaccustomed to cold bathing, a little warm water may be added. A large soft Turkish towel is well wetted with the salt water and the patient standing up is well rubbed all over with it. He should then be gently dried and should immediately dress. Brill's salt, in packets, may be placed in the water immediately before using, as it dissolves at once.

The wet abdominal pack.—The efficient application of this method of treatment requires the preliminary construction of the necessary appliance. Procure sufficient Turkish towelling in the length to go twice round the body. Sew one end of this to a piece of mackintosh of the same width, of sufficient length to go one and a half times round the body. To the free end of the mackintosh sew three or four tapes at regular intervals along the edge. Sew on the mackintosh at a distance from its junction with the towelling equal to the half of the circumference of the body a corresponding set of tapes. To apply the pack, the towelling is wrung out in either hot or cold water as indicated and wrung out so as just not to drip. The patient stands before the operator, who applies the towelling to the surface of the abdomen, in which position it is held by the patient whilst the remainder is carried round the body and applied evenly. The process is continued with the mackintosh, which is secured finally by the tapes, which will be found to come together when the pack is applied. The patient

then lies down upon a couch. The duration of the application is usually an hour.

This method of treatment will be found to be especially useful in the neuroses of the intestine and the various forms of mucous colitis.

The wet sheet.—This is applied in the following manner. A sheet of sufficient size to cover the patient is dipped in cold water, and wrung out until it will no longer drip. It is then wrapped round the patient, who is standing before the operator, in such a manner that it is in contact with the whole of the body. The operator then rubs, slaps, and massages the body through the wet sheet. This will impart quickly a feeling of heat to the skin, producing an intense reaction.

There is no doubt that this treatment is exceedingly useful in cases of neurasthenia, and as it can be very well carried out by patients with the assistance of their domestic servants, it is particularly applicable to private practice.

The Weir Mitchell treatment and the rest cure.

I am sure that no single line of treatment has done more harm in the cases of gastric neurasthenia than the Weir Mitchell treatment. Applied indiscriminately as it has been by some physicians, in the same manner that the Nauheim treatment has been abused in cases of affections of the heart, it has worked incalculable mischief in those cases in which the walls of the stomach were muscularly weakened. The number of cases of gastric neurasthenia in which the Weir Mitchell treatment, pure and simple, is likely to be of use is very limited, and even then it must be prescribed only with the greatest care and the digestion of the food which is administered carefully checked by a daily examination of the stools.

Much better results are usually to be obtained by a partial rest cure combined with the daily application of static or

high-frequency electricity, or of the sinusoidal bath, combined with massage and hydropathic measures. As an example of such a treatment we will take a sample day from the life of a patient undergoing it at a nursing home under my supervision.

7.30 a.m.—Application of the wet sheet with energetic friction. Return to bed.

8 a.m. Breakfast.—Perhaps porridge, a boiled egg, toast, butter, hot milk flavoured with tea, coffee, or chocolate.

9 a.m.—General massage of the whole body.

11 a.m.—Get up. Cup of beef tea.

12 o'clock.—A séance of static or high-frequency electricity at my consulting rooms.

1 p.m.—Patient lies down until lunch.

Lunch.—A little clear soup, a chop or a bird, mashed potatoes, a milk pudding.

2 p.m. to 3 p.m.—Patient lies down.

3 p.m.—Walk or drive in the park. Home at 5.

Tea at 5.—Tea and toast. Lie down until

7.30 p.m. Dinner.—Same as lunch, with the addition perhaps of fish and fruit.

9 p.m.—Bed and general massage.

Such a course of treatment will in most cases produce much better results than the ordinary routine of the Weir Mitchell treatment, consisting as it does of isolation, absolute rest, massage, forced feeding, and the unskilled application to the surface of the body of the coarse rough current from a thirty-shilling induction coil, administered by a nurse who has only learnt how to use it incidentally during her course at the massage school. Volts, ohms, the varying resistance of the human body, the different effects produced by differences of length in the secondary windings or by alterations in the rate of interruption are hidden mysteries to her. She usually does not know that there is more than one kind of

electricity, but on the strength of knowing how to start and stop her cheap obsolete induction coil she receives her certificate in massage and medical electricity, and either starts for herself as a "medical electrician and masseuse," or takes a situation at a nursing home where "electricity administered by specially trained nurses" is advertised upon the prospectus as one of the attractions! And then we wonder why medical electricity in this country is slow in gaining the position to which it is entitled as a therapeutic agent.

Cases illustrating diagnosis and treatment.

Dr. T. D. L., *æt.* twenty-three, consulted me on April 17th, 1896. Present illness commenced about the end of January, 1895, before which date he had had only occasional indigestion, having been run down in health by overwork for the M.B. degree. The symptoms at first consisted of a feeling of fulness at the end of meals, lasting about half an hour or so, and of a daily frontal headache, which was relieved by citrate of caffeine. He had progressively lost weight, having scaled 11 st. 4 lb. in January, 1894; 10 st. 7 lb. in January, 1895; and 9 st. 6 lb. in January, 1896.

Present symptoms consist of fulness after every meal, quite irrespective of its amount, and sometimes after a few mouthfuls only. The sensation is a feeling of "pressure", and there is, as a rule, no actual pain. This feeling of tension is sometimes present before a meal, and is relieved by pressure. There are usually slight eructations for about half an hour after meals. There is very often gurgling and splashing to be obtained by palpation in the stomach about three hours after meals. Usually feels best in the early morning, but sometimes wakes up with a dull feeling in the head or a slight headache. Is hungry before meals, but soon satisfied. No vomiting nor nausea, and no excessive thirst. Has gradually reduced his diet to the following,

using the stomach tube before meals to see what he could digest, and discarding what he could not :—

Breakfast.—Two pieces of toast or stale bread, butter, one egg, or the equivalent of white fish ; five ounces of cocoatina.

11.30.—Teacup of bovril.

1.30.—Toast as at breakfast, two poached eggs, or fish or tender meat, five ounces of egg-flip.

4.30.—Egg-flip.

6.30.—A meal as at 1.30.

9.30.—Bovril, one and a half ounce of whisky a day, no tea or coffee, sugar or milk.

Before commencing this diet he could often extract half a pint of undigested food before a meal with the tube. Now as a rule he finds his stomach empty in five hours.

He has noticed that milk, Benger's food, or milk puddings increase the flatulence very much, and that boiled rice comes back undigested after five hours.

Bowels are constipated, but are kept open by cascara. Is able to walk three miles a day. More than this tires him very much.

Physical condition.—Abdomen retracted and normal, slight epigastric tenderness, no splashing sound before a meal, one hour after dinner the stomach as estimated by percussion reaches to the umbilicus.

Four hours after a test dinner the gastric contents were as follows :—

Extract from the stomach on standing separates into three layers—a stratum of fat, a stratum of clear liquid, and a stratum of undigested meat and starch of a buff yellow colour. Total acidity 61, free HCl 25.

Filtrate dissolves white of egg in four hours. Potassium iodide test for absorptive power 15 minutes. Salol test 105 minutes.

No food débris in the morning after a later mixed meal.

The patient was then placed experimentally upon an oidi-

nary mixed diet, with the result of greatly increasing the secretion of HCl. After a month of this he commenced to suffer from a severe dull gnawing pain referred to the umbilicus, and coming on about three hours after meals. The total acidity was 140, with free HCl about 90.

Diagnosis.—Gastric neurasthenia. Myasthenia of the second degree. Hyperchlorhydria produced by mixed diet.

Treatment and result—The patient, Dr. L., only came to me for a diagnosis, and left immediately for the country, where he carried out his own treatment, which I believe consisted of periodical lavage, the constant galvanic current, and an appropriate diet. I have seen him some little while ago, when he reported that he was now very much better.

A. H. B., *æt.* twenty-eight, came under observation on May 4th, 1897, having been sent by his medical attendant. Was in good health until October, 1895, when he commenced to get nervous. In November of the same year had an attack of influenza accompanied by blocking of the colon, which had to be emptied by means of enemata. Was in bed several weeks. Since that time his present symptoms have gradually developed.

Symptoms.—Now complains of bad circulation, the hands being frequently cold and sticky. Occasional severe headaches, especially on the left side of the head, accompanied with great anxiety and giddiness and throbbing up the sides of the neck. Often suffers from a feeling of weight amounting to pain at the lower part of the back of the neck and down the spine. Tingling in the hands and legs, and occasional twitching of the muscles. He complains that when he commences to do any business he experiences a sense of weariness and emptiness in the head which culminates in a feeling as if he should go out of his mind. Is very nervous, and his legs shake on going up a high building. Has several kinds of morbid fear, being especially afraid of going to bed at night. Complains of wind, fulness after

meals, often accompanied by palpitation of the heart. He often has a bitter taste in the mouth for the greater part of the day. One of his most disagreeable sensations is a sensation of throbbing over a great part of the surface of the body. Appetite is fairly good, but there is confirmed constipation for which he has habitually taken laxatives for the last two years.

Often has a sinking and all-gone feeling, and feels faint in the middle of the morning.

Objective.—On examination the stomach is obviously atonic, as splashing can be elicited nearly as low as the pubes five hours after breakfast. No food residues are present in the stomach six hours after a meal or before breakfast. No other abnormal signs. Gastric chemistry normal.

Diagnosis.—Gastric neurasthenia. Myasthenia of first degree.

Treatment consisted of a daily application of the continuous galvanic current stabile with the anode at the nape of the neck and the kathode to the epigastrium, followed by the labile application of the anode to the sympathetic in the neck. Daily wet pack, regulation of the diet, and plenty of gentle exercise in the fresh air. Internally nitrate of silver, quinine, and aloes were given in appropriate doses. Under this treatment the patient was practically restored to health by the end of July, 1897, and returned to his home in the country.

Miss D., *æt.* thirty-five. Seen with Dr. S., February 15th, 1898. Rheumatic fever seven years ago. Influenza every year since. Commenced to be troubled with her digestion five years ago after some mental worry.

Symptoms.—Loss of appetite. Nausea almost continual both before and after meals. Epigastric pain immediately after meals, accompanied by distension. Frontal headache and pain in the nape of the neck almost constant for the last

three weeks. Deadness of the hands. Emaciation, has been losing flesh for one year.

Objective.—No splashing. Stomach is empty three hours after a test breakfast. Gastric chemistry normal.

Diagnosis.—Gastric neurasthenia.

Treatment suggested.—Lavage of colon. Galvanism. Soda and gentian with bromide.

Result.—Improvement.

Dr. C., *æt.* thirty, consulted me on February 26th, 1898. Good health up to five years ago, when he began to be troubled with dyspepsia. At this time he was overworked, and took his meals irregularly, and perhaps smoked to excess. *Symptoms:* Has no actual pain, but flatulence, pressure, and regurgitation, which do not appear to be related to any particular kind of food.

The uneasiness and pressure are chiefly before meals, and are relieved by food. Some little time ago was troubled at night with flatulence, but latterly this has not been as marked as eructation after food and gastric and interscapular weight and discomfort.

Objective.—On lavage before breakfast the stomach is empty, but the wash water often comes up coloured with bile. Gastric chemistry normal.

Diagnosis.—Gastric neurasthenia.

This patient made a good recovery under the continuous current, diet of scraped meat, and systematic muscular exercises.

Miss S., *æt.* twenty-six, school teacher, consulted me on April 29th, 1898. Was very nervous as a child, and as a young girl overworked herself. For years has suffered slightly from agorophobia and claustrophobia. Eight years ago sustained a severe nervous shock, and six months after that had a sudden nervous breakdown in the middle of the night. "Something seemed to snap in her head", and next day in the train, going to school,

she came over trembling and felt so faint that she was afraid that she would die before she reached her destination. This illness lasted all day, and she thought that she was going mad. After that she was afraid to travel alone, and since then has always carried brandy about with her. Six weeks ago had an attack of sickness lasting several hours. *Symptoms* · Now complains of loss of appetite. She may feel hungry, but her appetite always vanishes at the sight of food. Eructations of wind during and after the meals. Attacks of vomiting coming on without apparent cause. Frontal headache, loss of sleep, claustrophobia, sudden panics, with a sensation of sinking at the pit of the stomach, relieved by bringing up wind. She has attacks of fear of the most diverse kind. Is even afraid of being afraid, afraid of losing control of herself, and of running amok, afraid of being driven to injure herself or other people. *Objective* On examination the stomach is apparently dilated, reaching several inches below the umbilicus and splashing readily. No intragastric examination was made. *Diagnosis* Gastric neurasthenia. Probably myasthenia of first degree.

Treatment consisted of the continuous current. *Result:* I find the following note on May 27th. The effect of treatment has been surprising; she has lost all panics, has gained flesh, looks well, and the stomach now appears of normal size The patient visited me at the beginning of 1905, and informed me that she has been in perfect health since her treatment by me, and had lost all her troubles.

Mrs. M., *æt.* twenty-five, consulted me on May 5th, 1898. For the last year has suffered from pain in the epigastrium, which usually came on directly after food, and continued for a variable period.

Symptoms.—Appetite good. Sleep bad. Constant headaches. The chief trouble is the pain, which is apparently uninfluenced by different kinds of food, following even

soup or plain water. The pain is not relieved by alkalies. There is considerable belching after food, and marked constipation.

Objective.—No hyperchlorhydria. No food residues six hours after a mixed meal.

Diagnosis.—Gastric hyperæsthesia. Neurasthenia.

Treatment.—Constant galvanic current anode to epigastrium, kathode to nape of neck. Daily applications of from 15 to 30 m.a. Duration of treatment six weeks.

Result.—Cessation of pain after the end of the third week. As far as I know, there has been no relapse.

Mrs. C. was sent to me by her medical attendant on May 24th, 1898. For the last few months has suffered from extreme flatulence and belching of wind which troubled her at all times, even in the morning when the stomach should be empty and during the night. *Objective:* The stomach splashes nearly down to the pubes. Fasting stomach contains food residues, which show an excess of organic acidity but no free hydrochloric acid. *Diagnosis:* Myasthenia of third degree. Neurasthenia. Gastric fermentation. *Treatment:* Central galvanization. Vibration to the stomach. Daily lavage. *Result:* The patient improved somewhat and went abroad. She consulted me again early in 1903, having continued periodical lavage all these years, when she underwent a course of intragastric treatment with the triphase alternating current, which reduced the myasthenia to the second degree. Her present condition is that she has no residues before breakfast, but very occasionally six hours after a mixed meal if she is not careful what she eats.

Mr. L. B., aged twenty-eight. July 11th, 1902. Complains of drowsiness after meals; constipation; loss of appetite, loss of memory; flatulence, especially at night; regurgitation. *Objective signs:* None; no food residues; gastric juice normal. *Diagnosis:* Neurasthenia. *Treatment:* Constant current; anode to epigastrium; kathode to nape of neck;

20 m.a. three times a week for a month. Soda and gentian mixture. *Result:* Much relieved.

H. F., aged forty-one. July 9th, 1902. Has had dyspepsia on and off for years; sinking feeling before meals and distension directly afterwards; constipation; often has pain after meals coming on a couple of hours and relieved by food. *Objective signs:* Slight epigastric tenderness; splashing during the whole of the digestive period; stools are hard and dry and in small bits; no residues. After Ewald test meal, H = 60, A = 75. *Diagnosis:* Gastric neurasthenia; hyperchlorhydria. *Treatment:* Electricity in several forms failed to relieve, and the patient was eventually cured by means of lavage, alkalies, and attention to diet.

Mr. R. S., aged thirty. Consulted me on August 4th, 1902. In 1895 took creasote in excess for what was said to be a tuberculous affection and has suffered with his stomach ever since. *Symptoms:* Pain in the region of the stomach, which is almost constant unless he lives entirely upon milk; has attacks of panic in which he collapses and is unable to do his work; marked neurasthenic fatigue symptoms. *Objective:* Gastric chemistry and motility normal. *Diagnosis:* Gastric neurasthenia. *Treatment:* High-frequency bipolar derivation from solenoid, one electrode in rectum and one upon epigastrium; condensation; effluviation of abdomen. Pure phosphorus gr. $\frac{1}{100}$ three times a day in the form of syrup. *Result:* Cure in three months, with treatment three times a week.

Mrs. R., aged thirty-nine. October 29th, 1902. *Symptoms:* Pain after food; fulness; belching of wind; constipation; attacks of abdominal colic; passage of mucus in shreds. *Objective:* Stools contain mucus in considerable quantity; anacidity; delay in passage of charcoal along the alimentary canal. *Diagnosis:* Gastric neurasthenia; mucomembranous colitis. *Treatment:* High-frequency bipolar current in derivation from small solenoid, one pole in rectum

and one upon abdomen; effluviation of abdomen. Vichy water three times a day between meals in dose of 125 c.c. at a temperature of 95° Fahr. *Result*. After one month's treatment only occasional mucus in stools; bowels regular every day.

Mr. F. D. consulted me on November 2nd, 1904. Has suffered from neurasthenia for some years, having had most of the classical symptoms. Last year he suffered for some months from nervous diarrhœa. Now his chief trouble is fulness and nausea after meals. The discomfort is so great that he often produces vomiting in order to obtain relief. During the digestive period he is quite incapable of any mental work. He also suffers from causeless panics when in church or theatre or other place from which he cannot get immediate egress. These are accompanied by palpitation, and a sense of deadly sinking at the pit of the stomach. Sleep is bad and he suffers from frequent headaches. *Objectively* there are signs of stagnation of food in the stomach. *Diagnosis:* Neurasthenia, with atony of the second degree. *Treatment:* Lavage, with the use of the triphase alternating current; hypodermic injections of sperminum Poehl. *Result:* The patient slowly improved and the stomach became practically free from food residues. In March, 1905, he came again under treatment. His stomach troubles were much better, although he still suffered if he deviated to any great extent from the scheme of diet laid down. But now he is chiefly worried by sensations of confusion and unsteadiness which attack him in the street, and during which he has to catch hold of the nearest support. The symptoms were entirely removed by a course of static negative insulation, and he has since had no relapse.

Mrs. C. K., aged thirty. September 4th, 1903. Complains of sinking feeling before meals. Has severe attacks of what she terms spasm two or three hours after meals. The attack consists of great and painful distension of the

stomach with wind, which she is unable to bring up. This distension is accompanied with difficulty of breathing and sometimes palpitation. After a variable interval the spasm relaxes and she is relieved. The attack is evidently due to spasmodic closure of the pylorus from the irritation of the hyperacid contents of the stomach (pneumatosis). *Objective:* After Ewald test meal, A = 110, H = 95. *Diagnosis:* Hyperchlorhydria; pyloric spasm. *Treatment:* Daily application of the resonator high-frequency current to the epigastrium by means of a moistened electrode. This is usually followed by effluviation for a few minutes. Morning irrigation of stomach with weak alkaline solution. Mixture of bromide soda and gentian. *Result:* Apparently complete cure after two months' treatment.

Mr. B. C., aged fifty-three. February 26th, 1904. Has suffered from dyspepsia for twenty-five years. *Symptoms:* Flatulence both before and after meals; periodical attacks of constipation followed by abdominal pains and several large loose stools; fatigue on slight exertion; sinking sensation before meals; headache, loss of sleep, loss of memory. *Objective:* Slight tenderness over descending colon with spastic condition; gastric chemistry normal; hypotension. *Diagnosis:* Chronic colitis; neurasthenia. *Treatment:* High-frequency current from small solenoid, one pole in the rectum and one upon abdomen; dose 400 milliampères for ten minutes, followed by effluviation of abdomen; occasional dose of castor oil; alkalies and appropriate diet. *Result.* Considerably better, especially with regard to neurasthenic symptoms, after three months' treatment.

Miss M., aged twenty-nine. *Symptoms* · May 29th, 1904. Noises in the ears; dizziness; feeling of "shaking" occasionally all over her; palpitation; loss of appetite; constipation; sensations in the abdomen which she cannot describe; pain at the pit of the stomach. *Objective:* Stomach much dilated and ptosed; floating right kidney;

floating tenth rib. *Diagnosis:* Gastroptosis; neurasthenia. *Treatment*. Abdominal support; triphase current with intragastric electrode. *Result:* Improvement.

Mr. F. L., aged forty-three. Had indigestion as a child, when he used to vomit on his way to school, was unable to digest meat. During the last three years has been much overworked, and has had influenza several times. *Symptoms*. June 6th, 1904. Fulness after meals; loss of appetite; loss of energy; occasional attacks of pain shortly after food; lives on a very restricted diet and has lost weight; feelings of sinking and all-goneness. *Objective* After Ewald test meal, A=65, H=45, indigestion of starch; hypertension. *Diagnosis* Gastric neurasthenia. *Treatment* Positive static insulation; taka diastase; syrup of pure phosphorus gr. $\frac{1}{100}$. *Result* Very great improvement in general health; loss of most of the gastric symptoms.

Miss K., aged twenty-three. Quite well up to November, 1903, when she had a severe disappointment. *Symptoms* June 10th, 1904. Feeling of sickness, lasting several days at a time; loss of appetite; pain in the pit of the stomach on waking in the morning; sinking sensation if she goes for more than two hours without food; shortness of breath on exertion. *Objective* Splashing two hours after a test meal; no food residues, but a little free hydrochloric acid in fasting stomach; slight degree of hyperchlorhydria. *Diagnosis:* Gastric neurasthenia; hypersecretion. *Treatment:* Constant current by external electrodes; partial rest cure; morning alkaline irrigation of stomach. *Result*. Complete cure in two months.

R.W., aged twenty-four. Indigestion has been gradually coming on for the last four years, during which he has overworked himself at college, the commencement of his trouble dating from a few days' hard physical exertion which succeeded six months' mental worry. *Symptoms* June 21st, 1904. Nausea before food; flatulence; belching of wind;

constipation; feeling of weight and distension of the stomach after meals. The symptoms follow any kind of food and are not influenced to any great extent by quality or quantity. Great mental depression; loss of memory, and of the power of fixing the attention; cold feet and hands; the least excitement brings on indigestion; the bowels are not absolutely constipated, but the motions are insufficient in amount. *Diagnosis* Gastric neurasthenia. *Treatment* Positive static insulation; auto-condensation. *Result:* Complete cure after two months' treatment.

CHAPTER VI.

MODERN INTRAGASTRIC METHODS OF DIAGNOSIS.

THERE are two distinct methods of arriving at the solution of the clinical problem presented by a patient suffering from indigestion. In the first place we may attempt to discover the nature of a case by a study of its history, and of the symptoms present, especially as to their time relationship to food. It is true that we shall thus arrive at conclusions which may be in some cases approximately correct, but at the best our diagnosis will be a mere conjecture, and on a par with the opinion which we might arrive at in a case of aphonia without the assistance of the laryngoscope. The second method is to inform ourself exactly how long the process of digestion takes, what actually happens to the food in the stomach, how long the food remains in the stomach, and in what condition it leaves that viscus and passes into the duodenum. Our diagnosis thus becomes no longer guess-work, but approaches scientific accuracy.

One of the most striking differences between the medical practice of ourselves and that of our grandfathers lies in the fact that whilst they attempted, with more or less success, to distinguish one disease from another by a laborious analysis of subjective symptoms, our opinion is professedly based upon logical deductions from definite data obtained by modern methods of examination. This is

especially the case in diseases of the stomach, but even here it must not be supposed that we must use intragastric methods indiscriminately as a routine practice in all the cases of deranged digestion which come under our notice. It will frequently happen that these are neither advisable nor necessary, and, apart from cases where the use of the tube is contra-indicated, when we can diagnose a case of slight severity and short duration with reasonable certainty by the inductive mental processes, we should certainly do so, and not subject our patients to the annoyance of instrumental interference.

For practical purposes we may thus divide our cases into two distinct groups: those which do not, and those which do, necessitate the use of intragastric methods for their elucidation.

(A) Cases not requiring intragastric methods.

(*a*) *Slight temporary derangements of digestion obviously due to errors of diet or some other easily ascertained cause.*

Our diagnosis will be confirmed by the fact that these affections prove transient, and promptly recover under appropriate treatment. We must, nevertheless, always keep before us the possibility of such illnesses being in reality the characteristic attacks of gastric insufficiency which mark the earlier stage of pyloric stenosis or gastric myasthenia. The regularity with which they recur and the invariable manner in which they follow excess in diet will point to the necessity for a complete examination.

(*b*) *The slighter forms of gastric neurasthenia or nervous indigestion.*

The different effect at different times of the same articles of diet, the evident dependence of the symptoms upon the nerve tone of the moment, together with the characteristic

symptom-complex of neurasthenia, will usually lead to a correct diagnosis. In such a case the administration of a test meal with the subsequent examination of the stomach contents would not aid us very materially in forming our diagnosis, as the composition of the gastric juice is well known to vary considerably at different times even in the same case. The slight myasthenia so frequently present can be recognized by the use of a simple effervescing powder.

(*c*) *Cases of simple hyperchlorhydria in young men.*

The symptoms of this condition are so well marked that mistake is almost impossible. The epigastric pain coming on one or two hours after food, relieved by alkalies and albuminous food, its termination in many cases by the vomiting of an acid liquid, the limitation of pain to the digestive period, the absence of painful pressure spots or cutaneous hyperæsthesia, and the absence of either macroscopic or "occult" blood in the vomit or stools all point unmistakably to this affection. Probably there will also be a history of the excessive use of spirits or tobacco.

(*d*) *Dyspepsia in chlorotic girls.*

In these cases the trouble usually consists of hyperæsthesia of the mucous membrane of the stomach with or without hyperchlorhydria. If the pain follow immediately after the ingestion of food and does not undergo any exacerbation later on, we have probably hyperæsthesia only; if it is increased a couple of hours after food, when the hydrochloric acid becomes free in the stomach, there is most probably hyperchlorhydria. This distinction, unfortunately, is not absolute, as in many cases of hyperæsthesia a normal amount of free acid will give rise to pain. But there is really no necessity to ascertain whether there is an excess of hydrochloric acid, as in all cases where the pain increases

at the height of digestion the proper treatment is the administration of alkalies. In all these cases the chief and most important problem is to ascertain whether there is ulceration. This subject will be discussed in the following paragraph.

(*e*) *Cases in which ulcer is suspected.*

There are two good reasons why we should not pass a tube. In the first place, we might do mechanical injury to the stomach, and secondly, the information which we could obtain by so doing would probably be of little value for diagnostic purposes. There might or might not be hyperchlorhydria, and blood might be present or absent. The point which would have the most diagnostic significance would be constantly finding small quantities of blood in the stomach, but even this we can ascertain better by the examination of the stools. The important point would be the finding blood in the stomach on many occasions, and we can quite easily see that it would be difficult to pass a stomach tube sufficiently often to render our observations of much value. But if there is blood in the stomach it must of necessity pass into the intestines, and we can make as many examinations of the stools as we wish without annoying the patient. The blood in the stools may be in sufficient amount to communicate to them a distinct characteristic colour, or it may be in such small quantity as only to be demonstrable by chemical or microscopic tests. In this latter case it is technically known as "occult blood." Our observations in this direction will only be of real value if we take care that the patient is fed upon blood-free articles of diet during the period occupied by our investigations. The routine which I habitually follow is to put the patient to bed and first of all give one or two doses of castor oil. The diet is then restricted to milk, white fish, bread, sweetbread, potatoes, and farinaceous substances. After the

patient has lived exclusively on these for three days or so, we may be sure that the intestinal tract will now be free from any hæmoglobin derived from food. We can now commence to make a daily examination of the fæces, using for preference Teichmann's hæmin crystal test. A tiny fragment of fæces is rubbed upon a slide with a little salt. A cover-glass is applied, and some glacial acetic acid allowed to run in under its edge. The slide is then to be very slowly heated over a spirit lamp until the acid just commences to boil. If any blood be present the characteristic hæmin crystals will be seen on examination with a high power. If we find blood persistently present in the stools under the conditions mentioned above, there is in all probability an ulcer either of the stomach or duodenum.

As additional signs of some value we have the epigastric and dorsal painful pressure spots, areas of hyperæsthesia in the skin of the epigastrium, and the fact that the pain will vary inversely with the degree of comminution of the food. Also the fact pointed out by Murdock that orphol will usually relieve the pain of ulcer whilst it is without effect upon that of hyperæsthesia or gastralgia.

(*f*) *The digestive disturbances accompanying cardiac disease.*

As in the case of suspected ulcer the tube is contra-indicated, both because we may injure the patient and because we shall probably learn nothing of importance by passing it. The straining and general disturbance often accompanying the passage of a tube for the first time is exceedingly dangerous in organic disease of the heart, and may result in syncope or even in sudden death. The digestive troubles present in cardiac affections are in most cases either of a reflex nature or they are directly due to myasthenia, the result of venous stasis in the walls of the stomach. It is as well in all cases to make sure that they are not the result

of irritation of the mucous membrane of the stomach by digitalis and other cardiac tonics. An exact knowledge of the chemistry of digestion is fortunately not very valuable in these cases, as we can do practically nothing to relieve the gastric derangement until cardiac compensation has been restored.

Such then are the principal cases which we are justified in treating with a provisional diagnosis, but when we come to the more difficult and obscure clinical problems no attempt should be made to prescribe until the disease has been carefully studied, and the more modern methods of examination put into operation.

(B) Cases in which intragastric methods are necessary.

1. All cases in which there are signs of gastritis.
2. All cases which are prolonged and resist treatment.
3. All cases which are accompanied by loss of flesh, or cachexia.
4. All cases which have commenced rather suddenly in a person over middle age who was previously in good health.
5. All cases which are evidently progressive.

In such cases the probabilities are that our diagnosis will lie between—

(*a*) Chronic progressive non-malignant stenosis of the pylorus.

(*b*) Myasthenia with retention.

(*c*) Permanent hypersecretion.

(*d*) The later stages of chronic gastritis.

(*e*) The severe form of gastric neurasthenia.

(*f*) Malignant disease.

In order to make a diagnosis we shall require certain data from which we may legitimately make deductions. If our facts have been correctly observed and if our logic is sound our conclusions must be incontrovertible. The reason why the modern methods of investigating diseases of the stomach

have not yet become part and parcel of the everyday routine of the profession is, I am afraid, on account of difficulties for the most part purely imaginary. As a matter of fact the tests themselves are not difficult, do not require laboratory facilities, and are by no means many in number. One simply requires to know about half a dozen things, to be able to say, at any rate, which part of the digestive process is at fault, and whether the trouble is functional or organic.

In any obscure case of gastric disease we require to know the following points before we can make a diagnosis:—(1) The position of the stomach, and its apparent size. (2) The degree of muscular sufficiency of the stomach. (3) The condition of the gastric juice as to quantity and quality. (4) The presence or absence of fermentation in the stomach. (5) And the presence in the stomach of mucus in excess, and in certain cases also blood, pus, and the Oppler-Boas bacillus and fragments of mucous membrane.

We will discuss these points *seriatim*.

The position and size of the stomach.

I may premise by saying that it is impossible to make out for certain the size of the stomach by either percussion or auscultatory percussion. The difficulty of estimating the slight difference in pitch between the resonance of the stomach and colon respectively is so great that we can never be absolutely sure of our result, and it is quite a frequent occurrence to find that after we have, as we think, outlined the stomach by percussion, it will rise up under inflation in quite a different part of the abdomen.

The difficulty is nearly as great after the stomach has been filled with water, as some writers have recommended. I therefore strongly advise you, in cases where it is absolutely necessary to make out the size and position of the stomach, to abandon these uncertain methods in favour of

transillumination, and where this is not available inflation by air introduced through the stomach tube. Either of these, in the hands of anyone of average ability, will give reliable results.

Inflation with air.—This should always be done through a stomach tube, as inflation by means of an effervescing powder introduced into the stomach often fails, is extremely disagreeable (in fact, far more than the skilful passage of a tube), and has on more than one occasion produced dangerous symptoms. Moreover, the gas evolved in the stomach is quite out of one's control, and cannot be removed if symptoms of dyspnœa or pain supervene without the passage of a tube, which will under these circumstances probably be found very difficult, owing to the condition of the patient; on the contrary when the air is introduced by means of a small stomach tube, we can introduce just as much as we require, and no more. We can stop it at any moment, and can allow it to escape on the first appearance of any discomfort. We have, however, to bear in mind that in estimating the size of the stomach by inflation we must always accept the result obtained with reservation, as not only are we apt to over-distend an atonic stomach, but any intestines which are full of air and in contact with it may be forced out laterally, and thus increase its apparent diameter. The result obtained by inflation which is of most value is the position of the lesser curvature; and this is fortunate, as whilst we are usually able to ascertain the position of the lower border by percussion or by the auscultation of the limits of the splashing sound, we are unable to decide the far more important question whether gastroptosis be present by either of these two methods. The method of examining the patient by inflation is very simple. The patient's stomach being empty, a small tube is passed in the usual manner as he lies upon a couch; the single or double bellows of a spray-producer is attached, and air is gently blown into

the stomach, whilst the hand of the operator is allowed to remain in contact with the surface of the abdomen. As the air distends the stomach, it will be felt to rise under the examining hand, and its general position becomes at once obvious.

Transillumination.—We are rapidly coming to the conclusion that the best and most accurate method of ascertaining the position of the stomach is by the use of the gastro-diaphane. Transillumination of the stomach was first performed by Einhorn in 1899, who introduced a small Edison lamp into the stomach, and to him and more recently Kemp is due the credit of perfecting the technique and thus placing it in the range of practical diagnostic methods. The chief disadvantages in the method as introduced by Einhorn which prevented it from coming into general use were—

(1) The large size and clumsiness of the lamp. (2) The fact that owing to the presence of viscera containing air in contact with the stomach, the zone of light on the surface of the abdomen was often larger than the true area of the stomach. (3) The fact that the process could only be used satisfactorily on thin patients.

These objections have been practically removed by the construction of smaller lamps and by the introduction into the stomach of fluids having the power of fluorescence.

The modern apparatus consists of a very small lamp carried on the end of a small stomach tube in a small capsule, and is of such small dimensions as to be easily introduced, even in patients who are not accustomed to intragastric manipulations. It is conveniently illuminated by a small accumulator or a few dry cells. I may say that it is of advantage to use a rather small lamp when working with plain water, as otherwise the area of illumination is apt to be unduly extended, and an erroneous idea obtained of the dimensions of the stomach.

For the fluorescent liquid to introduce into the stomach we may make use of either of the following :—

1. Bisulphate of quinine gr. x. to a pint of water, with the addition of m. v. of dilute phosphoric acid. If the patient is susceptible to quinine it can easily be extracted before he leaves the consulting room.

2. Fluorescin. This is made by heating together phthalic anhydride and resorcin and appears to be devoid of any action whatever upon the human body, at least in the dose which would be used. It is a brownish powder, and can be obtained of Merck at a cost of one-and-sixpence per ounce. It is soluble in alkaline liquids and gives a green fluorescence. When the electric lamp is introduced into the human stomach filled with this solution the illuminated area is very plainly seen upon the surface of the body even in moderately fat patients, and as it is not only the light but also the colour of the fluorescence which we see on the surface of the body, we eliminate the factor of uncertainty produced by the spreading of the light which takes place when the stomach is only filled with water. As fluorescin is only fluorescent in alkaline fluids it is necessary to neutralize any gastric juice which may be in the stomach, the following routine being suggested by Kemp,[1] to whose work we owe a large part of our present knowledge of the subject, and whose diaphane is the best now made :—

"The patient should first be given a glass of water (eight ounces) in which fifteen grains of bicarbonate of soda have been dissolved. A second glass of eight ounces is then administered in which have been dissolved the same amount of sodium bicarbonate, one dram of glycerin, and one-eighth grain of fluorescin."

As the result of transillumination we may find—

1. *The stomach normal.*—Under these circumstances we can only delimit the inferior and left lateral borders, the

[1] *Medical News*, vol lxxxv p 257

remaining parts being covered by the liver. The illuminated area may possibly extend half-way from the xiphoid to the umbilicus. If below that point we should suspect the stomach of being dilated.

2. *Dilatation of the stomach.*—The lower border of the stomach may extend as low or lower than the umbilicus, but the important point which differentiates it from gastroptosis is that the upper border cannot be made out as the stomach still retains its surface attachment to the diaphragm.

3. *Gastroptosis.*—In all cases where the lesser curvature of the stomach can be made out there must be gastroptosis or other displacement of the stomach.

4. *Tumours in the interior wall of the stomach.*—Tumours in this situation will show themselves as dark spots in the centre of the illuminated area.

It has been stated by the earlier observers that a dilated stomach could be differentiated from gastroptosis by the fact that in the latter case the respiratory movements of the stomach were lost, whilst in the former they were preserved. This alleged fact is I think not to be relied upon, as in my experience it is very rare for any respiratory movements to be seen.

There are certain points which should be observed if we wish to make our diaphany a success.

1. The stomach must be empty of food.

2. The intestine must be evacuated by purges and enemata.

3. The bladder must be empty.

4. The examination must take place in a perfectly dark room.

5. For delimiting the stomach we must not use too strong a light in order to obviate diffusion as much as possible, a 5 c. lamp will be the best.

6. When our object is to make out the presence of tumours we may with advantage use an 8 c. lamp.

7. The patient must be examined in the erect position as well as lying down.

The recognition of motor insufficiency.

The next point for which intragastric methods are indispensable is the recognition of motor insufficiency. A healthy stomach, as we all know, should empty itself completely before the next meal. In atony of the stomach wall from any cause, this is not the case, and we get a condition to which the term motor insufficiency has been applied, in which the stomach is not able to empty itself at the proper time. We now recognize two degrees of motor insufficiency, the first in which the stomach cannot empty in six or seven hours, but can do so during the long rest of the night, so that it is empty before breakfast, and the second in which it is never able to empty itself completely. The former has been termed the stagnation form or second stage, and the latter the retention form or third stage of gastric myasthenia. It is of extreme importance to recognize these conditions both for purposes of diagnosis and treatment.

Many attempts have been made to devise methods by which we could do this without subjecting the patient to the inconvenience of passing a tube into the stomach, but up to the present without success, as although the results which we obtain may warrant us in strongly suspecting the existence of motor insufficiency, yet there are so many fallacies that when we want to make absolutely certain we are driven back to the oldest method of all, that of Leube, by which we ascertain whether the stomach has emptied itself by the simple method of passing a tube, and seeing whether any of its contents are still remaining in it or not.

There are one or two points which we must bear in mind if we wish to be successful. For instance, although by ordinary lavage we can often tell whether there are any

food residues in the stomach, we cannot, if we employ this method, measure them, nor can we use chemical tests with advantage, as the residues will be too much diluted by the wash water to give us useful information. It is therefore essential that the contents of the stomach should be extracted by suction, and we employ for this purpose an apparatus called the stomach aspirator.

This consists merely of a wide-mouth bottle closed by a rubber cork, through which pass two bent tubes. To one of these is attached an exhausting bulb, the other is conical for insertion into the end of the stomach tube. It is also essential that there should be a device for admitting air into the bottle. Everything being in readiness, and the patient seated upon a chair, you pass the stomach tube, insert the tube of the aspirator into the end of the stomach tube, and commence to gently compress and relax the bulb. If no fluid flows, let in the air and push the tube a little further into the stomach and try again. Continue thus searching the stomach at different levels until you either find the fluid or are convinced that the stomach is empty. You must particularly remember to always let in the air before moving the stomach tube either in or out. As you do this you will hear the air whistle into the stomach tube, showing that there was such suction within it that, had you moved it, you might have damaged the interior of the stomach. For the same reason you should invariably employ a stomach tube with a bevelled eye. The ordinary stomach tube of the shops with the punched-out eye is an excellent weapon for curetting the interior of the stomach, but bad for aspiration. If you cannot procure a stomach tube with a bevelled eye, you can bevel your own by searing it with a hot wire and rubbing with a cloth.

If you fail to find food residues, before pronouncing that the stomach is empty, always attach the tube without withdrawing it, to an irrigating apparatus and give the stomach

a good wash out. It not unfrequently is the case that food residues are adherent to the walls of the stomach and cannot be dislodged by simple aspiration.

If you bring away any residues by aspiration, carefully measure them and put them aside for examination. In order to save time it is best to allow the patient to take an ordinary mixed midday meal, and make your first examination just before his late dinner hour. If you find the stomach then empty you know that there is no motor insufficiency. If on the other hand you find food residues, you are informed that the stomach does not empty itself in five hours, but cannot yet tell whether you have the stagnation or retention form of myasthenia to deal with. You therefore wash out the stomach well, and make another examination before breakfast the next morning. When you propose to examine a patient for food residues it is always best to order him a meal composed of substances which are easily recognizable. One of the best dinners consists of minced beef made into cakes and grilled, the so-called Vienna steak, plain boiled rice, bread, and some purée of green vegetable such as spinach.

Suppose that we find food residues before breakfast, signifying that food is retained in the stomach, we know that we have before us a case in which the muscular apparatus of the stomach is unable to do its work of emptying the stomach into the duodenum. And if we have made out by other methods of examination that the stomach is enlarged, we know that we have to do with a dilated and incompetent stomach. This is so much knowledge gained; but before we can advise the patient effectually, we want to know whether the trouble is due to mere weakness of the walls of the stomach or whether in addition there is contraction in the pylorus or duodenum. This, as you can see, is of the greatest importance, as upon the answer to this question practically depends whether the patient shall undergo an

operation or not. There are two things which will help us to solve this problem.

1. *The examination of the food residues.*—Now in pyloric stenosis there is nothing to hinder liquids from leaving the stomach, but the constricted pylorus acts virtually as a strainer and holds back the more solid parts of the food. We shall therefore find that the food residues consist mainly of coarse particles of food. In myasthenia, on the contrary, we shall probably find the food in a much more finely divided condition.

It is found in practice that these facts hold good even in the later stages of pyloric stenosis, when the hypertrophied muscle has lost its power and myasthenia complicates the case. It should be, however, obviously more useful in the earlier stage when the stomach muscle still retains its power.

2. *The water test.*—This is a very ingenious test for ascertaining how much water passes out of the stomach in a given time, and, like the preceding, is useful for differentiating gastric myasthenia from the early stage of pyloric obstruction, in which the gastric muscle retains its tone. This valuable test has been to all appearances unaccountably overlooked in this country, as it does not appear in any text-book of medicine written by an Englishman.

The principle of the test is not difficult to follow. If you introduce 100 c.c. of water into the stomach and some time afterwards another 100 c.c. containing one per cent. of sugar in solution, and if you now extract some of the stomach contents and find that the percentage of sugar is still the same, it necessarily follows that the whole of the first 100 c.c. of water must have been got rid of. Likewise, if you find that the percentage of sugar in the portion you abstract is one-half per cent., then you know that the whole of the original 100 c.c. must be still in the stomach, as the sugar will equally diffuse itself through the whole mass of liquid.

The test is actually performed in the following manner:

300 c.c. of water are given to the fasting patient the first thing in the morning. One and a half hours later he is given 100 c.c. of water containing one per cent. of sugar. It appears to make no difference whether cane or grape sugar be used, but it is better to make use of the latter, as the analysis can then be made with Pavy's solution in the ordinary manner. The patient's abdomen is then grasped in the hand and gently shaken to mix up its contents, too much manipulation being avoided for fear that some of the fluid may be massaged through the pylorus. A tube is then passed and a few c.c. removed by aspiration. The percentage of sugar in this is now estimated by the formula 100 ÷ per cent. of sugar − 100, which will give you the number of c.c. remaining in the stomach.

A normal stomach, or one with pyloric stenosis in an early stage, will have disposed of the whole 100 c.c. of water in this time, and if any considerable quantity remains we are absolutely certain that myasthenia is present. In the later stages of pyloric stenosis where compensation has entirely failed this test will prove useless, but in these cases there will be other obvious signs which will make our diagnosis plain. It is in the early stage, where vomiting has perhaps not yet occurred, that we find it so valuable, and it is just these clinical problems which give us so much trouble to unravel.

In all cases in which we find food residues an examination should be made for free hydrochloric acid. If we find this to be present we then know that the case is complicated with continuous hypersecretion, a condition often set up by the irritation of retained food residues.

The examination of the stomach contents after a test meal.

In reading a monograph upon diseases of the stomach the student is apt to become confused and perhaps frightened at the number and apparent complication of the different tests

described, and to come to the conclusion that they are quite outside the scope of ordinary everyday practice. As a matter of fact, the actual tests which are of clinical value are very few, and not more difficult to perform than the ordinary routine examination of the urine for sugar or albumin. In fact, in many cases the practitioner can find out all he wants to know by simple inspection of the stomach contents without any chemical tests whatever. It is also a mistake to suppose that in each case the whole gamut of tests must be gone through. Usually the diagnosis will hinge on one or two points, and we direct our attention to these and leave the others alone. An example or two will make this plain. Let us take a case of severe pain in the gastric region coming on regularly an hour or two after food. We naturally suspect hyperchlorhydria. So we extract a little of the gastric juice at the height of digestion of a mixed meal of bread and meat and examine it, first with the naked eye. We see that the meat has practically disappeared, but that nearly the whole of the bread is present in a finely divided condition. We are now practically certain that we are right, since we know that hydrochloric acid in excess inhibits the digestion of starch, but readily digests meat.

But to make sure, we dip a piece of congo red paper in the stomach contents and it turns dark blue. This signifies that a mineral acid is present in the free state, and the only possible one under the circumstances being HCl, our diagnosis is confirmed. We know that the acid is in excess, because the bread was not digested, but if we wish to be still further convinced we have only to tritrate the filtrate with the decinormal solution of soda, using phenophthallin as an indicator, to find that the total acidity probably lies between 90 and 120. And as the normal is about 55 we evidently have a condition of hyperchlorhydria.

Take another case. We have a patient who has been steadily losing weight and going downhill generally, and

who suffers from loss of appetite and vague dyspeptic symptoms. In this instance it would be waste of time to test for HCl, as we know that this cannot be in excess from the absence of symptoms characteristic of that condition. But what do we want to know, and the fact upon which our whole diagnosis depends, is whether the gastric juice has, or has not, the power to do its work of digesting the food. So we extract some of the gastric contents after a mixed test meal and shall probably find that no digestion of any kind has taken place. The bread is in coarse particles and the meat unchanged. We filter a little and place it in a test tube with a little bit of hard-boiled white of egg and keep it in a warm place for a few hours. For this purpose Martindale's pocket incubator is very convenient. It can be placed in the vest pocket of the patient for a few hours, and will keep its contents at the temperature of the body. In another of the tubes we place a little milk, a few grains of bicarbonate of soda, and some of the filtrate of the stomach contents. If after a few hours we find that the white of egg is undigested with its corners still sharp and that the milk is uncurdled, we know that both pepsin and rennin are absent and that the patient is suffering from achylia gastrica, atrophy of the secreting glands of the stomach, or from malignant disease, probably the latter, because it is the most common of the three. Of course before examining the contents of the stomach we administer what is known as a test meal, and we shall save a great deal of time if we give two of these, composed of different articles of food, at an interval of a few hours and examine the contents of the stomach after the second of them. We shall in this manner be able to see whether the first meal has been digested and has disappeared from the stomach, and thus learn a great deal about the muscular sufficiency of the stomach, and can utilize the second one for a chemical examination. We thus kill two birds with one stone. This idea was suggested by

Salzer in 1896, and I cannot do better than recommend you to use his test meals. He first of all gives a breakfast consisting of 30 to 50 gms. of cold roast meat, free from fat and skin, and cut into dice, 250 gms. of warm milk and water, and 30 to 50 gms. of toast. Five hours after this meal he gives 30 to 50 gms. of stale wheat bread without crust or toasted particles, and 300 gms. of warm water. One hour afterwards the contents of the stomach are extracted. That is six hours after the first meal. The first meal should have nearly all left the stomach, and the second one be at the height of its digestion. And as both meals are entirely different in appearance any residues of the first one can be readily recognized.

The space at my disposal will not permit me to deal exhaustively with the examination of the stomach contents, and I shall in consequence confine myself to drawing attention to the chief objects of research when we are not looking for one thing only, as in the examples I have given, but wish to make a more or less complete examination. Under such circumstances we shall want to know—

1. Are there signs of gastritis?
2. Is the HCl normal, in excess, or diminished?
3. Are the peptic ferments present in normal amount?
4. Are there signs of abnormal fermentation?
5. Is the milk-curdling ferment present?

As I have already indicated, we can learn quite a great deal from simple inspection supplemented by the microscope.

For instance, after the double meal if we find—

(*a*) That the first meal has completely disappeared from the stomach, digestion is probably normal.

(*b*) If we find that all the meat has gone but that the toast remains in the stomach, we probably have hyperchlorhydria with some gastric motor insufficiency.

(*c*) If the meat is there but the toast is dissolved, then we

have one of the conditions marked by deficiency of peptic power in the gastric juice.

(*d*) If the whole of the meal remains behind in an undigested condition, we have the preceding plus motor insufficiency.

We now proceed to the examination of the second meal. We put it to filter and take the points upon which we seek information one by one.

1. The question of gastritis.—The practically only sign is the presence of an abnormal amount of mucus. We recognize this mainly by the rapidity with which the stomach contents filter, with which it is in inverse ratio.

2. The amount of HCl.—As a rule we only want to know roughly whether this is normal, in excess, or deficient. We can ascertain this quite near enough for most purposes by the use of Gunsberg's reagent, although with a little practice the tritation method presents no difficulty. Of course, my readers are all familiar with the use of Gunzberg's phloroglucin-vanillin test for HCl. A drop of the reagent mixed with a drop of the filtrate of the stomach contents and evaporated in a porcelain dish will give a rose-coloured ring round the margin. But it is not so generally known that this reagent can be used for estimating approximately the quantity of free HCl by gradually diluting the drop used until the reaction commences to disappear. Normally we can dilute the drop of reagent eight to ten times before this occurs. In cases where the amount of HCl is increased we are able to dilute it twelve times or more before we cease to obtain the characteristic red ring. Per contra in hypochlorhydria we may only be able to dilute it three or four times. We may say that as a rule anything below seven will signify deficiency, everything above ten excess, and between these limits a normal amount of HCl in the gastric juice.

3. The peptic ferments.—These I have already shown you

we test for, by means of the disc of hard-boiled egg and the drop of milk in the pocket incubator.

4. Signs of abnormal fermentation.—In cases where food residues are retained in the stomach we can derive information of the most valuable nature by watching the rapidity of gas formation. We finely divide some freshly extracted stomach contents without filtering and fill with it an ordinary Southall's ureameter. This we stand in a warm place such as a small room heated by a gas stove.

(*a*) In a normal stomach there will be very little gas formation in several days.

(*b*) Gas formation in a few hours will denote stenosis of the pylorus.

(*c*) Gas formation only after a few days will show that there is probably a dilated stomach, but without stenosis of the pylorus.

5. Is the milk-curdling ferment (rennin) present?—The recognition of the presence of rennin or its zymogen is of great importance in cases where we wish to ascertain whether atrophy of the secreting glands of the stomach has occurred. As far as we know at present, the absence of these ferments is a conclusive proof of this condition. The test is performed with the greatest ease by adding a few minims of the filtrate of the stomach contents to a little milk, carefully neutralizing it with an alkali, and keeping it at a temperature of 98° F. for fifteen minutes. If coagulation takes place within that time, rennin is present; if not, it is absent. In many of the cases where this test is required HCl is absent and consequently rennin, if present, will be in the form of its zymogen, and will not coagulate milk. By the addition of calcium chloride we convert the zymogen into rennin and repeat the coagulation test.

In cases where we require to go through the whole investigation the following routine may be conveniently employed. The patient takes a midday meal of bread and

meat, and you visit him at seven p.m. and extract the contents of the stomach.

(*a*) The stomach may be practically empty. In this event you know that the motor functions are normal.

(*b*) You find food residues. There is motor insufficiency of the first degree. Whether this is the full measure of the insufficiency you will not know until after the examination before breakfast.

You wash out the stomach clean and allow a dinner of meat and bread to be taken.

The following morning you visit the patient again before anything to eat or drink has been taken, and again extract the stomach contents.

(*a*) The stomach may be empty. In case it was found to be empty at your examination on the preceding day before the evening meal, your opinion that the motor functions are normal will be confirmed. If, on the contrary, food residues were found, you will know that although the stomach is unable to empty itself before the next meal it can do so during the night, and we have consequently motor insufficiency of the first degree only.

(*b*) The stomach contains food residues. There is motor insufficiency of the second degree.

(*c*) The stomach contains a few c.c. of a fluid, colourless, greenish or yellowish, and neutral or slightly acid. This is compatible with health.

(*d*) The stomach contains more than 20 c.c. of a fluid containing a considerable amount of free hydrochloric acid. There is hypersecretion of gastric juice. Having extracted all the stomach contents, the opportunity should now be taken to inflate the stomach before removing the tube, and to make out and mark upon the skin of the abdomen its exact position with a blue pencil. Lavage is now to be performed, and the patient given the Ewald test breakfast. One hour after this the stomach contents are to be again

extracted and examined for total acidity, free hydrochloric acid, and peptic power.

The conditions which we find after the test breakfast may be grouped as follows :—

(*a*) The bread is manifestly badly digested ; free hydrochloric acid in excess ; total acidity raised. We have certainly hyperchlorhydria present whatever its explanation.

(*b*) Bread is well digested ; total acidity and free hydrochloric acid normal. The filtrate digests egg albumen and coagulates milk. The secretory functions of the stomach are normal.

(*c*) The bread is tolerably well digested ; the total acidity is low ; free hydrochloric acid only a trace ; mucus is present in excess, as shown by slow filtration. There is chronic gastritis.

(*d*) The bread is not digested, but is in coarse pieces ; the filtrate does not digest albumen, and does not coagulate milk even after the addition of calcium chloride, and there is no free hydrochloric acid. The stomach is not secreting functionally active gastric juice, and if this condition is persistent and is observed on several subsequent examinations we know that we have either achylia gastrica, the terminal stage of a chronic gastritis with atrophy of the secreting mucous membrane, or malignant disease, which we shall be able to ascertain by further investigation.

You will by this time in all probability have made a diagnosis, except in those very difficult cases where we have to distinguish between stenosis of the pylorus of a non-malignant nature, myasthenia, severe subacute gastritis with atrophy of mucous membrane of the stomach, achylia gastrica, the grave form of nervous indigestion, and incipient carcinoma. In all these cases we may have different degrees of retention of food residues in the stomach, albeit from different causes. Although we may learn a great deal from physical methods of examination, yet we must take

into consideration in forming our diagnosis the well-known methods of evolution of these several complaints.

The history of progressive stenosis of the pylorus and of myasthenia may very much resemble each other. In both cases we may have attacks of motor insufficiency of the stomach, subsiding under rest and abstinence, and separated by periods of comparative stomachic health. We shall, however, in most cases be able to distinguish between them by the water tests already described. We can understand the *rationale* of this test if we take into consideration the conditions severally present. In stenosis of the pylorus in the early stages during which the diagnosis presents difficulty the stomach muscles retain their normal power; in fact there is often hypertrophy. Under these circumstances any water introduced into the stomach will be ejected through the pylorus without difficulty, whilst solid food will be arrested. In myasthenia we have a normal pylorus, but the muscular walls of the stomach are weakened and sag down under the weight of the stomach contents. In the erect position of the body the stomach will be more or less incapable of raising any liquid introduced into it to a sufficient height to get rid of it into the duodenum. Of course in the later stages of pyloric stenosis where myasthenia has supervened this test would be useless, but in these cases the diagnosis would be sufficiently obvious.

The sort of case which gives us the most trouble to diagnose is one which presents the following characteristics :—

The patient, a man of middle age, has suffered from indigestion for the last few months. There has not been any considerable loss of flesh, but he continues to get worse. Such a case is very common. We give him a test meal, and find that the stomach empties itself about three hours afterwards. If we aspirate a little before this period we find that the stomach contains undigested food in coarse particles covered with mucus. The filtrate of the gastric juice does

not digest white of egg in a waterbath, contains a little lactic acid, but no free hydrochloric. We are at this point justified in saying that the motor functions of the stomach are normal, but that the peptic power of the gastric juice is much reduced. The diagnosis will probably rest between malignant disease in an early stage and atrophic gastritis, although there are other possibilities which space will not now allow us to discuss. Let us see whether we can learn anything more by extending our investigations. But first of all as to probabilities, taking the history into consideration. Up to the last few months the patient has not suffered with his stomach. This is a most important point, for if the disease were atrophic gastritis it could only be the terminal stage of a dyspepsia which had extended over many years. It is consequently highly improbable that this is a case of chronic gastritis. We renew our examination of the stomach contents and ascertain that whilst rennin, as such, is absent, the rennin zymogen is present in considerable quantity. This fact, and the absence of mucus in excess, will practically exclude atrophic gastritis.

The task now before us is to confirm our suspicion that the patient is suffering from the early stage of malignant disease. This is one of the most difficult problems in medicine, and also one of the most important, since the only chance which there is of arresting the disease depends upon its recognition at a very early stage. By the time the classical symptoms are apparent it will probably be too late. As Riegel appositely remarks:[1] "If all the important symptoms as tumour, advanced cachexia, abundant quantities of lactic acid and absence of free hydrochloric acid, coffee-ground vomit, etc., are present, the diagnosis is easy, but it has about the same significance, as far as the patient is concerned, as a post-mortem diagnosis."

In a case like the imaginary one which we are discussing

[1] *Diseases of the Stomach*, p. 701 Philadelphia, 1903

the next thing to do is to ascertain whether lactic acid is produced in the stomach under the only condition in which it is of diagnostic value, namely, after a meal free from lactic acid germs has been introduced into a perfectly clean stomach, a stomach as clean as we can make it by ordinary lavage. Such a meal will consist of a porridge made with oatmeal which has been sterilized in an oven shortly before use. If after such a breakfast any lactic acid is found in the stomach contents, it proves almost conclusively that a portion of the stomach wall has lost its motility, and has thus given a colony of lactic acid bacilli an opportunity to form what practically amounts to a plate cultivation upon it. The adherent mucus in which the colony lives cannot be dislodged by ordinary lavage, and upon the introduction of any farinaceous material into the stomach will promptly set up the lactic acid fermentation in it. As malignant disease is practically the only condition which we are likely to meet which will produce such a local infiltration of the stomach wall, if we find lactic acid the certainty of our diagnosis is materially increased.

Another point which will help us is to examine the washings from the fasting stomach microscopically. If we find nuclei of cells undergoing atypical mitosis the probability of malignant disease will be very strong.

I will conclude this brief sketch by expressing my firm belief that in the majority of these obscure and complicated cases a diagnosis can usually be arrived at by a patient and systematic investigation, first of all collecting absolute facts, and then making such deductions from them as we may be justly entitled to.

APPENDIX.

ON THE PREPARATION OF FOOD BY COOKING, WITH ESPECIAL REFERENCE TO ITS USE IN THE TREATMENT OF AFFECTIONS OF THE STOMACH.

FOR the efficient and scientific treatment of most diseases of the stomach it is necessary to select food of a certain consistency, and in many cases we require to put the patient upon a graded diet, starting from liquids and running up through thickened soups, purées, panadas, and semi-solids until ordinary convalescent diet is reached. To a medical man commencing practice it is a task of extreme difficulty, especially in the hurry of daily work, to construct such a diet scale and to satisfy the patient's friends, who are clamouring for more detailed instructions. If he consults the ordinary manuals of cookery he finds a bewildering number of recipes, but arranged without any regard to their consistency, and it will involve a careful study of perhaps a large volume before he is able to select the dishes which will be appropriate to the case in hand. Moreover he soon finds that it is absolutely necessary to give specific instructions not only as to the articles of diet, but also how they should be cooked, if he wishes to do the best he can for his cases of dyspepsia. For if he contents himself with telling the patient, for example, to take "a light diet", what he will actually get will entirely depend upon the ingenuity of the cook and the patient's friends. The young doctor will soon find that even the making of a simple cup of beef

tea cannot be left to the skill of the ordinary middle-class cook, as either she will produce as the result of her efforts—a weak, watery broth, having allowed most of the goodness to remain in the meat which she has thrown away, or by treatment at a high temperature in the oven she will have converted the connective tissue of the meat into glue, and the result will be a beef preparation which when cold will set into a stiff jelly. In other words, she has manufactured a kind of superior size.

The aim and hope of the writer in this chapter is to give plain and straightforward directions for producing the articles of diet commonly ordered, arranged in groups according to their consistency, and thus, whilst being by no means exhaustive, to provide a sufficiently varied choice of articles of diet from which the physician may select dishes appropriate to the case under treatment. It is hoped that the arrangement of the recipes in order of consistency will facilitate the ordering of the progressive diets so often required and reduce the subject to something approaching scientific accuracy.

No attempt will be made to supply rules for the selection of food for use in the different affections of the stomach, and no diet tables will be given, for not only has the subject been dealt with in the preceding chapters, but the modern specialist does not now supply his patient with diet lists supposed, according to the procrustean plan, to be suitable to the disease from which he is suffering, but he constructs a scheme of diet for each individual patient modified by the following factors :—

1. The idiosyncrasy of the particular patient to certain articles of diet.

2. The condition of the digestive fluids experimentally ascertained.

3. The power which that particular stomach has of emptying itself at the proper time.

The construction of a proper diet will therefore comprise—

(*a*) The selection of the appropriate articles of diet.

(*b*) The decision as to whether the patient is to take three large meals in the twenty-four hours or four or five smaller ones.

(*c*) The degree of comminution of the food—whether it is to be liquid, semi-solid, or solid.

(*d*) Whether the food is to contain a maximum, minimum, or absence of fat, sugar, starch, or meat respectively.

The essentials of cookery or the office of the cook will be—

1. To produce the degree of comminution required.

2. To retain in as high a degree as possible the flavour of the food.

3. To cook solids in such a manner as to produce the most digestible result.

4. To avoid methods such as frying, which produce indigestible results.

All this the ordinary middle-class cook is incapable of doing from defects in her training, and consequently with the best intentions in the world will turn out dishes absolutely unsuitable for administration to patients suffering from disorders of digestion.

SECTION I. LIQUID FOODS.

In this group we have milk and its preparations, egg albumin, meat juice, soups, and broths. The subject of milk and its preparations will not be discussed, as it should be perfectly familiar to all those who have anything to do with the feeding of the sick.

Egg-water.

The simplest form of liquid nutriment is the white of egg, which may often be given and retained by patients unable to

take anything else. It is best administered in the following manner :—

Stir the whites of two eggs into half a pint of iced or very cold water. Add enough sugar or salt to render the flavour agreeable.

Egg-milk.

The white of one or two eggs mixed with cold milk is often of great use in cases where the patient has to be kept on liquid food.

Artificial meat juice.

In many cases among the poorer patients where meat juice is indicated it is impossible to suggest it on account of the expense. Fortunately we have a substitute in white of egg mixed with water. As Hutchison has pointed out, the white of egg contains twelve per cent. of egg albumin, and if to this we add twice its weight of water we shall obtain a clear solution containing four per cent. of coagulable albumin, or about as much as we find in an average specimen of the commercial meat juice sold in bottles. With the addition of a little Liebig's extract of meat you will have three ounces at the cost of a penny, hardly to be distinguished either by flavour or efficiency from meat juice costing twelve times as much.

Meat juice.

The simplest liquid form of nourishment to be obtained from meat is the juice. One has been able to obtain it commercially for some considerable time, but all these preparations suffer under the disadvantage of containing glycerin or other preservative which is sometimes irritating to the stomach. For these reasons, and also on the score of economy, it is best whenever possible to make use of home-made preparations.

It is impossible to extract the juice from raw meat without the aid of expensive machinery and hydraulic pressure, but

if it is slightly cooked it then becomes easy by the aid of very simple apparatus.[1]

Method 1.

Cut several thick slices from an underdone roast leg of mutton or sirloin of beef, remove every particle of fat, cut into small pieces, and put into the press.[1] Allow the juice to get cold and then remove any fat which has risen to the surface with a piece of blotting-paper. Serve either hot or iced.

Method 2.

Cut a thick slice crossways from a leg of mutton or take half a pound of lean juicy steak. Remove all fat, and beat slightly to make tender. Now place on a griller and heat it through without actually browning it. Cut into pieces and extract the juice in the press.

Clear soups and broths.

Clear soups may be defined as more or less perfect solutions of the albumin and extractives of animal substances, in combination with vegetable juices and flavouring agents. In their simplest form before the addition of the latter they are known as stock, and are variously designated according to their origin—bouillon or brown stock from beef, white stock from veal, and consommé from a mixture of veal, beef, and chicken. As a rule in ordinary cookery the stock is made first, and afterwards converted into the particular soup required by the addition of the appropriate flavouring agents. Stock thus made is often kept in a stock-pot and kept sweet by boiling up every day. This of course kills the germs which have developed since the last boiling and sterilizes the stock. Apart from the æsthetic objection to consuming dead germs, the contents of the stock-pot become after a little time so rich in extractives that soup made from it is highly

[1] A special press for the purpose of preparing small quantities of meat juice is made by S Nye and Co , 139, Oxford Street, W.

irritating to the gastric mucous membrane. In the preparation of food for invalids, especially stomach cases, the stock-pot should therefore be absolutely abolished and the soup or broth made at one operation from the meat and vegetables.

Clear soups are used in scientific dietetics for the following purposes :—

1. As the lowest rung of the dietetic ladder.

2. Clear strong soups in small quantity are given at the commencement of a meal to excite the secretion of gastric juice, especially when we are feeding the patient on substances devoid of much flavour or in cases of chronic gastritis.

3. Strong soups are given cold in the form of a jelly to patients upon a strictly liquid diet, to allay the craving for solid food.

4. Weak clear soups are used instead of water for stewing vegetables or farinaceous substances, to render them more palatable and digestible.

Beef tea.

This is a form of weak stock and differs from soup in not containing any vegetable ingredient.

The nutritive value of beef tea depends entirely upon the manner in which it is made, and, sad to say, many of the recipes given, even in well-recognized books on invalid cookery, give quite erroneous directions. As an example I quote the following from a well-known manual used in a cookery school :—

"Quick beef tea.

"Mince half a pound of gravy beef, put it in a saucepan with half a pint of water and bring it quickly to the boil. Let it boil for five minutes. Pour it off into a cup and it is ready for serving."

Whatever the product may be, it is certainly not beef tea as I understand it. The method appears to have been care-

fully devised to keep all the goodness possible in the meat and to prevent it from entering into solution!

In order to make beef tea in a scientific way we must observe the following points:—

1. The meat must be divided as finely as possible either by passing it through a mincing machine or by scraping to a pulp. This exposes as large a surface as possible to the action of the water. When meat is only cut into blocks the juices in the inside are largely retained and do not enter into solution.

2. First of all the meat must be soaked in cold water in order to extract all matters soluble in cold water.

3. Then the proteids which are soluble at different temperatures must be extracted by gradually raising the temperature, the average increment not exceeding one degree a minute, thus taking about two hours to arrive at a temperature of 138° Fahr. It is important that the temperature should not rise above 167° Fahr., as at this point coagulation will take place.

4. The next step will be to turn the meat out into a cloth and express all that you can. We shall then have obtained some real beef tea.

5. The final process is to cook the tea by raising once to the boil. Prolonged boiling is to be avoided, as it renders coagulated albumin tough and indigestible.

As a matter of fact such a scientific method is hardly practicable, and any of the following recipes will give excellent results.

Method 1.

Take a pound and a half of gravy beef, carefully remove all fat, and pass through a mincing machine. Place in a Gourmet pot with a pint of cold water and let it stand an hour (upon the ice in summer). Every quarter of an hour stir well with an iron spoon, pressing the meat well down. Now place the Gourmet in a saucepan containing enough

water to reach about half-way up its side. Keep slightly under boiling-point for three hours, replacing the water which evaporates from the saucepan. Strain and serve.

Method 2.

Take a pound of gravy beef and a pound of shin of beef. Remove the meat from the bone of the shin, and with the gravy beef pass through the mincing machine, and cook in a Gourmet as in the preceding recipe. In the meantime break the bone up with a chopper and place in a small saucepan with a pint of cold water. Bring slowly to boiling-point and cook until the liquor is reduced to one-third. Strain it off and add the liquor to the beef tea already made in the Gourmet.

Method 3.

Take a pound and a half of gravy beef free from fat and mince it fine, or take the pulp scraped from a beefsteak, and place in a Gourmet pot with a pint of cold water, a small lump of sugar, a small piece of salt, a teaspoonful of tapioca. Cook for three hours. Strain out the lumps only with a colander.

Raw beef tea

Take three ounces of finely scraped beef pulp and three tablespoonfuls of cold water. Place together in a jar and stand in a warm place for an hour. Strain, and serve in a coloured glass.

White stock.

First of all prepare four young carrots, one turnip, and one onion, a leek, and half a head of celery by washing and cutting in pieces. Now place four pounds of knuckle of veal in a stewpan together with the bone of the meat chopped in several pieces, five pints of water, and a teaspoonful of salt. The marrow must be removed from the bone, as it should not be used in making stock. Bring to

the boil quickly, skim, and add the vegetables. Now remove to the side of the range and simmer for five hours, skimming occasionally. Now strain into a basin through a cloth and set aside to cool. Next day remove the fat from the surface and wipe the top of the jelly (which it has now become) with a damp cloth. In this condition, eaten as a jelly, it forms a palatable and nourishing food, or it may be heated and used as soup, or may be used for stewing tapioca, lettuce, endive, or spinach, instead of water.

Brown stock.

This is made in exactly the same manner as the preceding, substituting for the veal four pounds of shin of beef. Or the soup may be made from equal parts of veal and beef.

Gravy soup.

This is a more highly flavoured soup than the stocks already given. Take six pounds of shin of beef, four pounds of knuckle of veal, and trimmings of poultry if you have them, and cut into small pieces. Place a quarter of a pound of butter in the bottom of the soup boiler, and add the pieces of meat, and let them slightly brown, stirring them up from below continually with a wooden spoon. Be careful not to let them burn in the slightest. Now add two or three slices of lean well-flavoured ham and six quarts of water. Now bring to the boil and remove any scum that rises. As soon as scum ceases to rise remove to the side of the fire and add four carrots, a turnip, four onions, a small head of celery, one or two blades of mace, a bunch of savoury herbs, pepper and salt to taste, and four lumps of sugar. Simmer slowly for six hours. Relatively smaller quantities may of course be used.

Poule à pot.

Take a pound and a half of leg of beef, the same quantity of rump steak, and half a fowl. Cut into small pieces and place in a stewpan with carrots, turnips, cabbage, celery, and leeks, or any other vegetables in season, and six pints of water. Season with salt, pepper, and one clove. Boil up gently, skim, remove to the side of the fire, and allow it to simmer for four hours. Twenty minutes before serving add an ounce of rice. Strain out the meat and serve with the rice and vegetables. Or as an alternative method, the whole may be strained through a cloth and served as a clear consommé.

Mutton broth. No. 1.

Allow two and a half pounds of neck of mutton with two tablespoonfuls of barley to simmer in two pints of water very slowly for four hours. Strain out the meat and remove the fat. Now add to the liquor three carrots and turnips and two leeks or onions, all cut very fine. Boil until the vegetables are quite tender. Strain.

Mutton broth. No. 2.

Cut a pound of neck of mutton into small joints, trim off all the fat, and place in a saucepan with a quart of water and half a saltspoonful of salt. Bring to the boil and skim well. Now add a dessert spoonful of pearl barley well blanched, tapioca, or sago, chopped parsley, six peppercorns, and, if the flavour is liked, a clove. Simmer for two hours, and then add a teaspoonful of chopped parsley, a carrot, and a small onion. Simmer for another hour and serve.

In cases where the vegetable flavour is contra-indicated omit the carrot and onion.

Rapidly made broth.

This recipe is useful when it is essential to quickly provide a cup of broth for an urgent case.

Cut the meat from half a chicken and chop up half a pound of lean beef into small pieces. Pass all this twice through a mincing machine. Now pound for a few minutes in a mortar. This pounding can be omitted if the mortar is not handy, but it much improves the quality of the product. Place the finely divided meat in a stewpan with the carcase of the fowl chopped into pieces. Add a pint of cold water and a little salt, and bring slowly to the boil. Whilst the meat is stewing prepare a small carrot or half a large one, a leek, half a head of celery if in season, by washing and cutting into small pieces. As soon as they are ready, add the vegetables, together with a small onion, into which has been stuck a clove, and simmer for half an hour. Strain out all the bones and vegetables, season, and serve.

Eel soup.

Take half a dozen small eels, clean, skin, and chop into pieces about one inch in length. Place them in a pint and a half of water, bring to the boil, and skim. Now remove to the side of the fire and simmer for forty-five minutes. Strain.

Maggi's essence.

This preparation can be confidently recommended as a means of easily imparting flavour to any soup or broth. It appears to be different from any ordinary sauce, and must not be used as such. In fact it is injured by cooking, and must be added drop by drop just before serving, until the full flavour required is obtained.[1]

[1] Can be obtained from Cosenza and Co., 95, Wigmore Street, London, W.

Maggi's consommé.

This will be found extremely useful for the extemporaneous production of a clear soup of a vegetable nature and containing no meat extractives. It is a paste put up in gelatin capsules, which only require dissolving in hot water to form a most delicious consommé.

Meat jellies.

Allied to clear soups we have the meat jellies, as although apparently of a solid consistency, they become reduced to fluid form before reaching the stomach.

It will be found in practice that many patients with affections of the stomach are able to retain soup which is administered cold or iced in jelly form, when the same preparation will be immediately rejected when hot. For this reason meat jellies should receive our careful attention. Any soup will set into a jelly if it contains enough gelatin, this of course depending upon the ingredients of which it is composed. If a soup sets into a jelly on cooling, and it is desired to administer it in this form, all fat must be carefully removed from the surface by wiping it with a damp cloth.

Among the commercial jellies the following are worthy of especial notice.

Beef jelly (Mosquera).

A concentrated, predigested, and nutritious food product resembling in physical characteristics an extract of beef, but superior in all respects. The chief recommendation for this preparation over those with which it competes lies in the process of manufacture, the proteid-digesting ferment from pine-apple juice being employed, which converts all the naturally insoluble nutritive constituents of the beef into a soluble and predigested form. It is entirely devoid of

the objectionable bitterness and disagreeable odour that have heretofore characterized products of this nature. It is well adapted as a food for convalescing invalids, or as a basis for soups and other dishes in the kitchen.

Fluid beef jelly (Mosquera).

This preparation is practically identical with the solid beef jelly except in form, its main feature of advantage being that it is readily miscible with either hot or cold water.

In the sick-room, fluid beef jelly is invaluable. In many cases of illness the hot beverages are distasteful and contra-indicated; here fluid beef jelly will be found most serviceable. Dissolved in ice-water it forms a refreshing, nourishing, and stimulating beverage that will prove delicious even to the fastidious taste of an invalid. It will quickly relieve fatigue, exhaustion, and, in many cases, nervous prostration.

SECTION 2. THICKENED SOUPS AND BROTHS.

These may be conveniently prepared by the addition to any clear soup of a carefully prepared purée of farinaceous substances, vegetables, poultry, game, meat, or fish. This is by far the most convenient method when catering for dyspeptics. A quantity of stock having been prepared, we are thus able, by the addition of the appropriate thickening, to prepare a continual variety of thickened soups in small quantities, a thing we cannot do if we make the thick soup *de novo*.

I shall therefore, with one or two exceptions, confine myself to the consideration of this method, and indicate briefly a few of the thick soups which we may prepare from a good white or brown stock.

Soup may be thickened by the addition of gruel, prepared meat powders, eggs, and animal or vegetable purées.

Soup thickened with gruel.

The simplest way for producing a thickened soup is by mixing a thick farinaceous gruel with an equal quantity of strong soup. The gruel may be made of Robinson's prepared groats, oatmeal, lentil or pea flour, or of arrowroot, and should be made slightly thicker than when designed to be eaten as gruel. One practical advantage of this method is that it enables us to produce a peptonized soup with an agreeable flavour. All attempts to peptonize soup directly are practical failures, owing to the disagreeable flavour of the product. But by making a thick peptonized gruel and mixing it with an equal quantity of strong stock we produce a soup which retains all the flavour of the original soup used and is devoid of the bitter taste of peptone.

Soup thickened with meat powders.

The following are among the meat powders which may be used to thicken soup :—

Home-made meat powder.

Boil some lean beef until thoroughly cooked, remove all fat, and allow it to cool. Now pass through a mincing machine, place upon a plate, and dry in a slow oven until all the moisture has evaporated. Grind in a coffee-mill.

Beef meal (Mosquera).[1]

A predigested powdered meat, representing in actual nutritive value six times its weight of good lean beef. It is entirely devoid of all objectionable taste or smell, and can be tolerated with ease by the most delicate stomach. As distinguished from any similar product heretofore known, it contains all the constituents of the meat, whether soluble or insoluble, in a predigested form ready for assimilation.

For administration, Mosquera beef meal may be mixed

[1] This may be procured from Parke, Davis, and Co.

with any soup or broth having sufficient consistency to suspend it, or added to chocolate, in combination with which it makes a delicious beverage.

Somatose.

This is a light yellow granular powder, easily soluble in water, and consists mainly of albumose. Although strictly speaking it does not thicken the soup to any extent, it may be given with advantage in many cases dissolved in it with the object of increasing its nutritive qualities.

Soup thickened with raw eggs

A very useful method of thickening soups is by the addition of raw eggs. The simplest way of doing this is to stir one or two raw eggs into some good brown or white stock. Care must be taken that this is not too hot, in order that we may avoid the coagulation of the white of the egg. The proper method, however, is by taking the yolk only of the eggs and making with milk or cream what is technically known in cookery as a "liaison". Break the eggs into a cup, separate the whites, and beat up the yolks with a few spoonfuls of milk or cream. Add whilst continuing the beating a dash of nutmeg and a little butter. Place the stewpan containing the soup which you want to thicken, which should have been just raised to boiling-point, at the side of the fire and add the liaison drop by drop, stirring all the time and taking care that it is not again raised to boiling-point.

Soup thickened by the addition of animal or vegetable purées.

Raw meat soup.

The pulp which has been scraped from a raw beefsteak is pounded in a mortar until it is of the consistency of butter and put through a sieve. It is now worked up with some

lukewarm brown stock in a basin until it is smoothly and thoroughly incorporated.

This is now poured into a fresh portion of boiling stock which has just been brought to the boil but is now commencing to cool. The mixture should be of the proper temperature for immediate consumption.

Sweetbread soup (Hemmeter).

Soak a sweetbread for one hour in cold water, changing it several times during this period. Drain it and let it simmer for one hour in brown stock, diluted to half its strength, or use what is known as second stock. When it is quite done and perfectly tender drain it and cut into small pieces, removing all fibres, skins, bloodvessels. Now put it through a wire sieve with the aid of a wooden spoon, moistening it with stock to assist the operation. Now stir it well up in the soup which you wish to thicken, bring to the boil, and serve.

Brain soup (Hemmeter).

A calf's brain is allowed to lie in cold water for one hour, in order to draw out the blood contained in it. It is now drained and again well washed. It is now to be cooked for one hour in brown or white stock which has been slightly salted. It is now drained and put through a sieve. It is now mixed with the soup required to be thickened a sufficient quantity of fresh stock and brought to the boil. The yolk of an egg may be added if desired.

Soup thickened with green vegetable purée.

Any soup may be thickened simply by the addition to it a few minutes before serving of purée of lettuce, endive, or spinach.

Commercial ready-prepared thick soups.

Among the best of the commercial ready-prepared and concentrated thick soups are the Maggi Cross-Star soups, which consist of circular tablets of compressed farinaceous material. When prepared according to the directions with water a very good thick vegetable soup is the result. When stock is used instead of water we obtain an ordinary thickened meat soup of excellent quality. These useful soups are made in the following varieties :—

Barley (Orge), Green Pea (St. Germain), Green Wheat (Crème de Blé vert), Julienne, Lentil, Pea, Peas and Bacon (Pois au Lard), Peas and Haricots (Bonne-Femme), Peas and Rice, Potato (Parmentier), Rice, Rice and Carrots (Rez-Crécy), Rice and Julienne, Scotch Gruel, Semolina, Small Paste (Petites Pâtes), Spring Vegetables (Printanier), Tapioca and Carrots (Tapioca-Crécy), Tapioca and Julienne, White Haricots.

Method of preparing the Cross-Star soups

The method is substantially the same for all the soups, the only difference being in the length of time required for cooking. "Break the tablet into a cup or bowl and mix into a thin paste with a little cold water, then pour it into a pint of boiling water and let it cook gently for fifteen to twenty minutes. Serve the soup with sippets of bread fried in butter."

Instead of water we may of course use a white, brown, or a fish stock.

Milk soups.

These may be made with tapioca, semolina, vermicelli, or rice. As an example of the method we will take rice.

Blanch 2½ ounces of best Carolina rice in plenty of water. Pour off the hot water, strain, and turn the rice into cold water. Drain off the water thoroughly. Place three pints

of milk in a two-quart saucepan, and bring it to the boil. Now add the rice and continue boiling for an hour.

Add a little salt and sugar and serve.

SECTION 3. GRUELS AND PURÉES.

Gruels are really purées made of farinaceous material, and whilst of firmer consistency than thickened soups are not so thick as porridges. Almost any farina may be used for their production, the most suitable being fine oatmeal, such as Robinson's prepared groats, barley meal, lentil flour, Ravalenta Arabica, pea flour, arrowroot, and ground rice. In any case they may be made with plain water, milk, or thin stock. They may also be plain or peptonized. I shall give one example of each variety.

Water gruel.

Take a tablespoonful of fine oatmeal and work it into a smooth paste in a basin with a little cold water. Whilst stirring all the time pour in gradually a pint of boiling water. Now turn it into a saucepan and boil gently for ten minutes, continuing to stir. Strain through muslin or a tamis and serve.

Milk gruel.

Mix one tablespoonful of Robinson's prepared groats with a little cold water into a smooth paste. Boil half a pint of milk, and when boiling pour gradually on the groats, stirring all the time. Return the mixture to the saucepan and boil for ten minutes. Add salt or sugar to taste and serve.

Gruel made with stock.

Mix smoothly a tablespoonful of Robinson's prepared groats, lentil flour, or Benger's pancreatized lentil flour with a little stock. Put half a pint of good stock in a saucepan and bring to the boil. Pour slowly upon the mixed farina,

stirring all the time. Return to the saucepan and boil ten minutes. Serve.

The essential difference between a gruel and a purée consists in the fact that whilst in the former the starch is actually in solution and transformed into a gelatinous mass, in the latter the ingredients are in a fine state of subdivision and merely in suspension. We may divide purées into three groups—

1. Those made of dried vegetable material, including in this group, however, potatoes.
2. Purées from fresh green vegetables.
3. Meat and fish purées.

In these three groups the essential method of preparation is the same. The ingredients are softened if necessary by immersion in water, are cooked, are reduced to a fine state of subdivision by passing through a sieve, and are then heated to an agreeable temperature.

Pancreatized lentil purée.

A very useful predigested vegetable purée may be made by means of Benger's pancreatized lentil flour, in the manner given for the preparation of gruel in the last recipe, in this case using sufficient of the lentil flour to render the final product of the consistency of a purée.

Useful purée may also be made from Ravalenta Arabica, or from ordinary lentil flour, using either milk or stock.

Haricot purée.

Soak a quart of white haricot beans in water all night. Drain, and place in a saucepan with two quarts of cold water, a sliced onion, and a teaspoonful of salt. Bring to the boil, and then remove to the side of the fire, and simmer gently for four hours. Pass through a wire sieve, add a pint of milk, return to the saucepan, heat, and serve.

Lentil purée.

Prepare a pint of red lentils by washing and soaking in cold water for one hour. Drain and place in a saucepan which has been well buttered inside with an ounce of butter, add to it a sliced onion and, if in season, three or four sticks of celery cut up small. Place upon the fire for five minutes, shaking all the time. Now add two quarts of cold water and simmer for one hour. Pass through a hair sieve, put back into the saucepan, heat, and serve.

Potato purée (Hemmeter).

Take three or four good-sized potatoes; bake or boil in their jackets; cut open, remove the floury part from the interior, and pass it through a coarse hair sieve; add a little butter, milk, and salt, mix well together, return to the saucepan, and heat with constant stirring for five minutes.

Carrot purée.

Scrape them clean, wash them well, and cut into pieces. Put into a saucepan with some white or brown stock, and stew for half an hour if young, or if old for one and a half hours. Pass through a sieve with a little of the stock, replace in the saucepan, dust well with flour, and cook for ten minutes, stirring all the time.

Rice purée.

Take a quarter of a teacup of rice, wash it well in several waters, and put to soak all night. Drain off the water and put the rice with a little butter and one pint of white or brown stock in a double saucepan and stew for from one to two hours. Drain and pass through a sieve. If desired, the yolk of an egg may be added.

Purée of spinach (Hemmeter).

The spinach leaves are carefully picked, washed, and laid in boiling salt water, in which they are to be cooked slowly without being covered, otherwise they lose their colour easily. After twenty minutes put them on a sieve, pour cold water over them and press them, cut very fine and then pass through the sieve. Heat some butter in a saucepan, add the spinach, cook until their moisture has evaporated to a certain extent, season and powder with a little flour, moisten with a little stock, and cook for eight minutes. Before serving add a few spoonfuls of good gravy.

Purée of endive or lettuce

Stew several heads of endive or large lettuce in brown stock, drain, and cover with cold water. Drain off the water again, cut up small and pass through a sieve. Now heat some butter in a saucepan and add the endive. Whilst constantly stirring heat until its mosture has evaporated, then powder with flour and moisten with a little good brown stock or gravy from a roast joint of beef or mutton. Season to taste and cook for a quarter of an hour on the side of the range.

Cream of endive or lettuce.

Stew several heads of endive or lettuces in white stock, drain, and cover with cold water. Drain again, cut up small and pass through a sieve. Now heat some butter in a saucepan and add the endive. Heat until the moisture has evaporated, then powder with flour, and add enough hot milk to well moisten the mass. Bring it to the boil, stirring it well all the time, season with pepper and salt, and simmer for fifteen minutes. If white stock be not available, water may be used in this recipe.

Purée of cauliflower.

Take a cauliflower, cut it up in large pieces, wash and drain. Now put it into a stewpan with an ounce of butter, a clove of garlic, three cloves, and a little parsley, basil, and marjoram. Cook it very slowly for ten minutes and then add some veal broth, and continue the cooking until it is quite tender. Now turn out upon a colander and drain carefully, at the same time removing the garlic and other flavouring agents. Now pass it through a sieve, return to the stewpan, add a few spoonfuls of white or brown stock, heat, and serve.

Mixed vegetable purée.

Take three carrots, washed, scraped, and cut into slices, one head of celery if in season, two leeks, a lettuce, and a small cabbage, all washed and cut into quarters. Place all these vegetables in a saucepan with a quarter of a pound of butter and cook for ten minutes, stirring continually. Add one quart of cold water, bring to the boil, skim, and remove the saucepan to the side of the fire and simmer for one hour. Pass through a hair sieve, heat, and serve.

Veal and barley cream.

Pass the lean of half a pound of veal cutlet through a mincing machine, and place in a saucepan with half a pint of water, half an ounce of pearl barley, and half a saltspoonful of salt. The barley must have been soaked for an hour in cold water. Simmer for two hours. Strain off the liquor into a basin. Pound the meat and barley together in a mortar, and rub through a hair sieve with the aid of some of the liquor. Add two tablespoonfuls of cream, heat, and serve.

Chicken cream.

Place the raw flesh of half a chicken which has been passed through a mincing machine in a gallipot with half

a saltspoonful of salt, and tie on a cover of waxed paper. Simmer for two hours in a saucepan half full of water. Take the meat out and pound it to a pulp in a mortar. Now rub the pounded chicken through a sieve, adding a little of the liquor to facilitate the process. Stir in a tablespoonful of cream and warm before serving, being careful not to bring to the boil.

SECTION 4. FOOD IN PULTACEOUS FORM

Porridges, panadas, and meat pulps.

Following the purées we naturally come to the panadas (from *panis* bread), which may be defined as cooked animal food in the form of pulp of a firmer consistency, usually containing bread. We may make them of chicken, pigeon, game, veal, or fish.

Panadas when properly made should be of the consistency of bread sauce, which in fact is the simplest of panadas, and an excellent and much-neglected article of diet for invalids. Nothing can be more grateful to a weak and sickly stomach than a well-made plateful of bread sauce, and it will often be relished and tolerated when other more scientific articles of diet are rejected.

Bread sauce. Method No. 1.

Take a medium-sized onion, and stick into it two cloves, some peppercorns, and a small shalot. Place in a saucepan with a pint of milk, bring to the boil, and place at the side of the stove to keep hot. Now take two ounces of freshly grated bread crumbs and mix roughly with half an ounce of butter and a little salt. Be careful not to overdo the salt. Now take the onion with the cloves, pepper, and shalot out of the milk and put in the bread crumbs. Boil for ten minutes, add a tablespoonful of cream, and serve.

Bread sauce. Method No. 2.

Take the crumb of a French roll and place in a saucepan, together with half a pint of water, five or six peppercorns, half an onion, a pinch of salt, and a piece of butter about the size of a walnut. Boil it until quite smooth, stirring it constantly. Now add a piece of butter the size of a walnut, and as it melts mix well with the sauce.

Bread sop.

This is not, strictly speaking, a panada, but the recipe may conveniently be given in this section. Although so simple, it is often retained by the stomach when more elaborate foods are rejected. It is especially valuable from its cheapness, as it may with advantage replace costlier preparations when prescribing for poor patients.

Cut some stale bread in thin slices, remove the crust, break into pieces from one to two inches square, and place in layers in a basin. Fill up with absolutely boiling water. Allow it to stand on the hob for a quarter of an hour. Now place a plate on the top of the basin and drain off the water, using no pressure. Now put several small pieces of butter on the top of the bread, and replace the basin covered with the plate at the side of the fire until the butter is melted. The dish is now ready, and should be eaten with pepper and salt. In cases where there is no contra-indication the dish may be made much more palatable by using stock (brown or white) instead of water.

Bread panada.

Proceed as in the last recipe, using boiling stock. After draining, beat well with a fork, and put the bread into a saucepan with one ounce of butter. Keep at a gentle heat, stirring all the time until it is perfectly smooth. It may be served hot or cold.

Chicken panada. Method 1.

Take the flesh from a boiled chicken and pass it through a mincing machine with the crumb of a French roll soaked in milk. Now pound it in a mortar until reduced to a paste. Pass through a wire sieve with a little stock. Put into a saucepan, heat, and serve.

Chicken panada. Method 2.

Take the flesh of a young raw chicken, cut into pieces, sprinkle with salt, and place in a well-buttered Gourmet pot. Place in a saucepan with enough water to come half-way up the sides of the Gourmet pot. Cook for an hour. Now remove the meat from the pot, pound it in a mortar with the yolk of an egg, and pass through a sieve. To the juice which remains in the Gourmet pot add a couple of tablespoonfuls of cream. Put this with the chicken into a saucepan and heat gently for a few minutes, carefully keeping it from coming to the boil. Serve on toast with a squeeze of lemon.

SECTION 5. SEMI-SOLID.

Soufflés, pâtés and pains of meat, game, and chicken.

Of thicker consistency than the panadas, we have the varieties of pastes prepared from animal substances which have been termed soufflés, pâtés and pains. For example, pain de volaille, pain de foie de veau, pâté de gibier.

These are essentially thick panadas, which having been placed in a mould and subjected to further cooking can be turned out and retain the shape. Consisting as they do of finely divided flesh, they may be conveniently used as the next stage after panadas in the progress towards absolutely solid food.

Meat or game soufflé.

Pass raw meat, game, or poultry three times through a mincing machine. Mix it with white of egg and whisk it up to the consistency of cream. Fill with it tin or earthenware moulds or shapes and steam for an hour.

Chicken cream.

Take the meat from a young raw chicken and pass it twice through a mincing machine. Mix with a couple of tablespoonfuls of bread crumbs, the same quantity of milk, and half an ounce of butter. Pound it all well together in a mortar, pass it through a sieve. Whisk up well with the white of an egg. Now fill with it well-buttered moulds and steam for an hour. Turn out and serve with a white sauce over it.

Soufflé of chicken or game.

Take a small chicken or other bird and remove the flesh from the bones and pass through a mincing machine twice; melt half an ounce of butter and stir into it one ounce of flour and finally half a gill of milk. Cook in a saucepan until it will leave the side of the pan clean. We have now a panada which we mix with the meat and an egg and pound well in a mortar. Season to taste, rub through a sieve, and steam in well-buttered moulds for fifteen minutes.

Soufflé of chicken (Bezly Thorne).[1]

Strip off from the bones the whole of the meat of a chicken, pass it twice through a mincing machine, and pound in a mortar. Now rub through a sieve so as to separate all gristle and fibres. Add two eggs and sixpennyworth of cream and mix well together. Put into well-buttered moulds and steam for twenty minutes.

[1] For this valuable recipe I am indebted to the courtesy of Dr. Bezly Thorne, who has used it for many years in his practice

Fish soufflé.

Take a whiting or other white fish and remove the flesh from the bones; melt half an ounce of butter and stir into it one ounce of flour and finally add half a gill of milk. Place in a saucepan and cook gently until it leaves the side easily. We have now a panada, which we mix with the pieces of fish cut up small and with an egg and pound well in a mortar. Season to taste. Steam in buttered moulds for fifteen or twenty minutes. Turn out and serve with any fish sauce.

Rabbit cream.

Take the flesh from a rabbit, pass twice through a mincing machine, pound in a mortar and pass through a sieve. Chop the bones of the rabbit up small and place in a saucepan with a piece of carrot, turnip, and an onion, and a pint of water. Allow it to simmer for an hour. Now mix together one ounce of butter, the yolk of two eggs, and a tablespoonful of cream. Whisk the whites of the eggs to a froth and add. Stir well together and put into a well-buttered Gourmet pot with the rabbit. Place it in a saucepan half full of water to cook. Whilst it is cooking strain the liquid from the bones, thicken with cornflour, simmer for ten minutes, and put aside as a sauce. Turn out the contents of the Gourmet pot when quite done into a hot dish, and pour the sauce over and serve.

SECTION 6. SOLID FOOD.

Cookery for the dyspeptic and convalescent.

For the efficient treatment of the affections of the stomach the physician, as we have seen, requires to have at command a diet scale ranging from liquids by successive steps to solids, the stages being represented by thickened soups,

gruels, panadas, and purées. In the present section we have to briefly touch upon the method of cooking food for patients, who either having run up the dietetic scale under the direction of their medical adviser have reached the point when the diet may be of a solid nature, or for those who possessing weak stomachs easily overtaxed, wish so to order the preparation of their food as to minimize the chances of acquiring an affection of that organ. With the exception of a few recipes my remarks will necessarily be of a more or less general character.

There is no reason why the food for the dyspeptic should be tasteless or devoid of flavour. In fact the reverse obtains, as we have seen that the quality and quantity of the gastric juice secreted depends very largely upon the actual enjoyment which the food affords the palate. It should therefore be the constant study of all those who have to cater for dyspeptics to present the food in the most appetizing form, preserving the natural flavours and those produced in the act of cooking in as high a degree as possible, attention at the same time being given to the avoidance of any method which can render the food difficult of digestion.

There are three chief ways in which an inexperienced cook may spoil the best raw material.

1. It may be saturated with fat.—We get an example of this in fried chip potatoes as it is too often served up in the domestic circle. Instead of the delicate yellow crisp fingers filled with the mealy pulp which almost melts in the mouth, we have dark leathery lumps offensive to the eye, palate, and stomach. The reason is not far to seek, residing as it does in an imperfect technique. For instead of plunging the slices of potato, resting on a wire basket, beneath the surface of absolutely boiling fat, thus effectually sealing the surface of the chip with a thin elastic impermeable coating to preserve the interior from the penetration of fat, she has simply fried the slices of potato in a little fat in an ordinary frying-

pan, for all the world exactly as she would have done a rasher of bacon.

2. The food may be over or under done.—In the former condition it is probably rendered more difficult of digestion, in both the flavour is destroyed.

3. By imperfect adjustment of the heat used at different stages of the cooking process.

(*a*) The goodness may have been allowed to escape.

(*b*) The surface may be toughened, and thus rendered more or less impermeable to the gastric juice.

But forewarned is forearmed, and knowing the pitfalls into which one may fall, we may, with a little study, easily learn to escape them.

THE PREPARATION OF MEAT.

It is of course needless to remark that meat should be of the best quality and perfectly fresh. As the digestibility will depend largely upon the method of preparation, the following points should be observed in cooking for the dyspeptic :—

1. The juices should be retained in the meat. This is managed by commencing the act of cooking at a comparatively high temperature, so as to seal up the surface, the subsequent cooking being carried out at a lower temperature.

2. Cooking should be carried to that point at which the meat reaches its acme of tenderness and juiciness, and no further.

3. Gravies should consist mainly of the juices of the meat itself, and not be artificially concocted from stock, extract of meat, or other material rich in extractives.

4. Stews, ragouts, entrées with thick or highly seasoned sauces, and twice-cooked meats should be entirely eliminated from the dietary.

It follows, therefore, that the cooking processes to which

meat intended for a dyspeptic should be subjected should be practically limited to boiling, stewing, steaming, braising, roasting, grilling, and frying. We will discuss these in rotation.

Boiling.

This mode of cooking consists in immersing the article to be cooked for a suitable time in water which is maintained at a sufficient temperature. The results obtained will depend practically upon the technique employed. If we place the meat or fish in a saucepan of lukewarm or cold water and gradually bring it to the boil, a portion of the albumin which is soluble at a temperature below 150° Fahr. will be dissolved out, and enrich the water in the saucepan to the detriment of the meat. We thus make a fairly decent soup, but the meat is spoiled. If, on the other hand, we immerse the meat in water at a temperature above 160° Fahr., at which most of the albumin coagulates, we shall form an impermeable layer over the surface of the joint, which will effectually confine within it the nutritive and sapid juices, and we can then continue the process at our leisure at a lower temperature with the certainty of getting a good result.

To boil a joint, then, or a fowl, we should immerse it in a relatively large saucepan of boiling water to which a little salt has been added and let the water just boil up again. Keep it boiling for about five minutes and then remove the saucepan to the side of the fire, or if using a gas stove, turn the gas down and let it simmer gently for the remainder of the time. As soon as the water comes to the boil the water must be skimmed carefully. After the initial boiling to coagulate the surface, the remainder of the cooking is effected at a temperature of 200° to 204° Fahr. In fact a lower temperature, such as 170°, may be used with advantage if we are willing to devote the necessary length of time. The time required for cooking at this low temperature is about three times that used in the ordinary way.

Roasting.

Roasting in front of the fire is undoubtedly the ideal method of cooking meat, poultry, and game. Unfortunately, as time goes on it becomes ever less and less practicable, as modern ranges are not built in such a manner as to permit it, and we have to imitate it as nearly as we can by baking. Whenever possible, the meat for the dyspeptic should be roasted in front of the fire instead of baked; and I am sure that such a one would find it the best investment he ever made in his life to instal in his kitchen an old-fashioned open range, roasting-jack, and screen. In roasting in front of the fire the most important point is to commence as near the fire as possible, to seal up the surface of the meat. This will occupy about eight minutes for a medium-size leg of mutton, ten minutes for a sirloin of beef, and four minutes for a fowl. At the end of this period the roasting-jack is drawn back a foot or so away from the fire and the cooking continued, taking care that the meat is well basted from time to time and that a moderately good fire of the same intensity is continually kept up.

Baking.

As a rule most of the meat which is served up nowadays as "roasted" has been cooked in the oven. It is useless to insist that patients should roast their meat in front of the fire, since, as we have already observed, the modern range is not constructed in such a manner as to allow this process to be carried out. We must therefore make the best we can of a bad job, and study in what manner we may produce in the oven the nearest approach to the result obtained by means of the old-fashioned roasting-jack. The whole success of the process lies in the intelligent manipulation of the heat of the oven, and is only difficult to the average female cook who works entirely by rule of thumb, and often appears to be entirely ignorant of the very elementary scientific basis of

the processes she is using; and in most cases, even if she did know the proper method, simply would not take the trouble.

The whole thing is absurdly simple. There are three stages through which we pass meat when cooking it in the oven, with a proper temperature peculiar to each.

First stage.—In this, as in boiling and frying, our object is to seal up the surface of the meat to prevent escape of its juices. With this object we introduce it into an oven which is heated to about 240° Fahr. This is known as a quick oven, and we should make sure that it has reached the proper temperature before the meat is placed in it. It can quite easily be done by even the most inexperienced if a thermometer is fixed inside the door. These thermometers are now commercial articles and can be obtained, among other places, at Messrs. Negretti and Zambra's.

Second stage.—The temperature of the oven should be lowered for the remainder of the cooking. This is effected in various kinds of stoves in different manners, either by opening ventilators in the oven door, by closing flues, or by turning down the gas with which the oven is heated.

Third stage.—The cooking should be terminated by browning the surface of the meat in order to imitate as nearly as possible the appearance and taste of a joint roasted in front of the fire. This is done by simply raising the temperature of the oven for a few minutes.

During the whole of the process the meat should be basted at intervals, and this necessity is one of the greatest drawbacks to cooking in the oven, as to do it the oven door has to be opened and with the immediate result of lowering the temperature. Various self-basters have been devised which overcome the difficulty to a certain extent, one of the best of these consisting of a covered dish in which the meat is placed. The lid is provided with a receptacle having a perforated bottom. If a piece of fat be placed in this it will

melt and automatically baste the meat. At the same time the vapour which rises from the meat being confined within the cover will recondense upon it and keep it in a state of moisture.

One of the ways in which ignorant and careless cooks spoil good meat is by getting the oven too hot at first. This necessitates the door being kept continually open after the first half-hour.

Grilling.

One would almost suppose that even a "plain" cook would be able to cook a steak, but even a highly paid domestic in my experience hardly ever gets one just right except by accident. As one watches the chef in a grill-room turn out perfectly cooked steaks and chops with unvarying accuracy for hour after hour, it appears that there should be no difficulty in it, and as a matter of fact there *is* no difficulty if one or two elementary points are borne in mind.

My excuse for discussing such a rudimentary form of cooking must be the importance of the subject, and the well-known fact that dyspeptics often have to live upon grilled meat for lengthened periods.

The first thing to do is to put the grill on the fire to get it hot. This should be done at least five minutes before you commence cooking. In a restaurant grill-room the grid is a fixture and therefore always at the proper temperature.

The next duty is to see that the fire is level, glowing red all over, and that the layer of incandescent fuel extends well beyond the edges of the gridiron.

The next point to observe is to rub the chop or steak over with olive oil. If you watch the cook in the restaurant grill-room you will see that in front of the grid is a trough into which all the melted fat from the meat which is grilling drains. If you watch him as he commences to cook a chop you will see him take it with a pair of tongs and dip it in

the melted fat and then place it on the bars of the grid. As you have not any melted fat ready you use the olive oil as a substitute. When you first commence to cook the chop or steak the gridiron must be so near the fire that the meat will almost be singed. In fact sometimes the fat covering it will momentarily blaze up. This is necessary to give the peculiar flavour of perfectly grilled meat and to seal up the surface.

Having started it at as high a temperature as you can, you now remove the grid a little further from the fire so that the cooking is finished at a lower temperature. But the important point to bear in mind now is that *you must not now leave the fire for even one moment*, but keep turning the chop every two minutes until it is done. This is necessary to get the cooking absolutely even. And you will find if you have followed out these directions that you have your chop just as perfectly cooked as you could get it done on the grill of one of the best restaurants.

Frying.

The points to which attention should be drawn are the following :—

1. All the fat used must be thoroughly clarified. Butter should be clarified after every time it is used. This is not necessary with fat, which after using should be poured into a basin in which it will solidify. When cold it may be removed bodily from the sediment and used again.

2. The fat should be at the proper temperature before the substance to be fried is introduced into it: 345° Fahr. for meat and fish, 400° Fahr. for whitebait.

3. As a rule we should use a deep pan, which will hold such a quantity of fat that the article fried shall be completely covered. Potatoes and fish are put into a frying-basket and lowered into the boiling fat.

4. Chops and steaks and cutlets as a rule should never be

prepared by frying for the use of the dyspeptic. The exception is the case of cutlets which have been covered with egg and bread-crumb. When properly and delicately fried these are unobjectionable, as the outer coating can be removed and not eaten by the patient. This is also the case with fried fish.

5. Bacon is usually fried in its own fat. This is quite wrong, because the meat will have become quite hard by the time the fat has melted. It is a much better practice to put a little clarified fat in the pan and allow it to melt before introducing the rashers of bacon.

Fried mutton cutlets.

This is one of the very few dishes prepared by frying which we dare to give a dyspeptic. Curiously enough, clinical experience shows us that it hardly ever disagrees, if done just so: Into a deep frying-pan put plenty of fat. Heat it until vapour rises, or a bit of bread thrown in will turn brown at once, or the fryometer registers 345° Fahr. First of all prepare the cutlets by trimming them, dipping in yolk of egg and then into bread-crumbs. Place the cutlets in the boiling fat and cook for about two and a half minutes. Then turn them. If you have seized the right minute the cooked side will be of a golden-brown colour. Now cook the other side to the same extent; remove, drain, and serve very hot. The average time required for the actual cooking in the fat is five minutes. Longer than this will spoil them and render them indigestible.

Vienna steak.

Take half a pound of steak and pass it twice through a mincing machine. Season with pepper and salt and pass again through the machine with one-quarter of its bulk of fresh bread-crumbs. Mix with the yolk of an egg and form into balls about the size of a tangerine orange. Fry

in butter. These may be served surrounded with purée of spinach, with a poached egg upon the top of each.

Grilled calves' brains

Boil some calves' brains and cut into thick slices after they have become cold. Put them on small skewers and dip them in a vinaigrette sauce, consisting of oil, pepper, salt, and chopped parsley. Now dip them into egg and bread-crumbs and grill for several minutes.

Fried sweetbreads. Method 1.

As soon as the sweetbreads have been procured they must be blanched to prevent them from turning sour. This is done by placing them in a saucepan with enough lukewarm water to cover them and bringing them to the boil. They should be then at once taken out, wiped, and cut into slices about half an inch in thickness. These are now covered with egg and bread-crumb in the usual manner and placed in a frying-basket, taking care that they do not touch each other. We now place a pound and a half of lard or clarified dripping in a stewpan and heat it to a temperature of 345° Fahr. as shown by the frying thermometer, or by throwing into it a piece of bread. Place the frying-basket under the surface of the fat for three minutes or less. Turn the sweetbreads out upon a piece of whity-brown paper on a plate and drain, and whilst they are doing so wash a few sprigs of parsley, put them in the frying-basket and immerse in the boiling fat for about one second. The cutlets are to be served upon a napkin garnished with the fried parsley.

Fried sweetbreads. Method 2.

Take a calf's sweetbread. Blanch for seven minutes, drain, and let it cool whilst pressed between two plates with a kitchen weight upon the top. Place in a baking dish with two ounces of butter, the juice of half a lemon, pepper and

salt, cover with buttered paper, put in the oven, and cook for half an hour. Remove it from the oven, let it cool, and cut into slices. Cover with egg and bread-crumb, and fry for ten minutes in clean boiling fat in the manner described in the last recipe.

Sweetbreads in white sauce.

Blanch the sweetbreads, drain them, trim, and stew for one hour in stock with a slice of lean bacon or ham, skimming occasionally during the whole of the time. Mix together a gill of white sauce, the yolk of an egg, and a few drops of lemon juice. Place the sweetbreads in the same and heat until well warmed through. Serve.

Sweetbread financière.

This is a very excellent method of cooking sweetbreads when a delicate dish is required to tempt a failing appetite. Blanch the sweetbreads in the usual manner, drain and press. Now cut into thick slices and place in a stewpan the bottom of which has been covered with minced vegetables and bits of bacon. Pour in enough stock to well cover the sweetbreads. Cook until reduced to one-quarter. Now fill up again with stock and reduce again. Do it a third time. The dish will now be done and the sweetbreads may be served with the thick gravy poured over them.

Boiled pigeon or partridge

Prepare a puff paste. Clean and season the bird and envelop it in the paste, and tie in a cloth. Boil it for forty minutes. When it is done remove the paste and serve the bird, pouring over it a sauce composed of its own gravy and a little stock rubbed up with its liver.

Boiled chicken. Method 1.

The great drawback to boiled fowl cooked in the ordinary way is the absence of flavour. This may be avoided by cooking in stock. Prepare a chicken for boiling in the usual way, place it in a stewpan with sufficient stock to cover it. Let it boil for five minutes. Now remove to the side of the fire and allow it to simmer gently until it is done. Drain and serve. A piece of bacon in the pot will improve the flavour.

Boiled chicken. Method 2.

Truss for boiling in the usual way. Weigh it. Put it into a stewpan and cover with a good stock. Add an onion and a little dried julienne of vegetables. Boil quickly for five minutes. Then simmer twenty minutes for each pound and twenty minutes over. Drain. Put on a hot dish and serve.

Broiled breast of a bird.

Cut off the breast in one piece. Butter all over, dip into flour, and broil over a clear fire on a gridiron for from five to eight minutes, turning it occasionally and basting from time to time with a little melted butter.

Small bird such as a quail on toast.

Slit the bird in two, and wipe the inside. Dredge it with flour, put upon a skewer, and broil in front of a clear fire in a Dutch oven. In default of this it may be done under a gas griller. Serve on hot buttered toast.

Fillets of chicken with oysters.

Take off the meat from the breast of a fine raw fowl. Remove the skin and flatten each of the two fillets thus obtained with a cutlet bat. Now roll up each fillet, placing in the centre of each a bearded oyster. If the fillets are too large we can cut each of them in two. Pepper and salt each

fillet and add a drop of lemon juice. Now envelop each rolled-up fillet in a piece of buttered paper and place in a stewpan with enough stock to cover them. Cook for about twenty minutes. Serve on sippets of toast.

Fricassee of chicken.

Cut a chicken into pieces, flour it, and place it in a stewpan with enough hot water or weak stock to cover it. Now add a bouquet of herbs and a couple of small onions and a little salt. Bring it up to the boil, skim, and then remove to the side of the fire and allow it to simmer until thoroughly cooked. The next thing to do is to drain the fowl and place it where it can be kept hot whilst you are preparing the sauce. This you do by frying together a little butter and flour, mixing with it the yolk of one or two eggs and half a pint of stock or the liquor in which the chicken has been cooked. When this is done place in it the chicken and a dash of lemon juice and cook for about eight minutes.

Poulet à la Pagani.[1]

Take an earthenware casserole and well rub the inside with a lump of fresh butter. Place in it a raw chicken, a few button onions, a few potatoes cut up into small pieces, two tablespoonfuls of white wine, pepper, and salt. Place a lump or two of butter on the top and also inside the fowl, cover the whole well up, and let it cook on the top of or in a very hot oven for from fifteen to twenty minutes.

Then add a few small pieces of bacon, a few fresh mushrooms cut up fine, turn the chicken upside down,

[1] For this and the following two recipes I am indebted to M Meschini, the proprietor of Pagani's restaurant, the entrecôte à la minute being his own invention. The directions for making poulet à la Pagani appear here for the first time in print, although it has for many years enjoyed a well-merited reputation among London gourmets

cover up again, and let the whole cook until it is rather well done.

When the chicken is ready for serving, fry in a separate pan a little lump of fresh butter, and when the same is well browned and foaming, squeeze into it the juice of half a lemon. Pour this over the chicken in the casserole, cover it up, and serve immediately very hot.

Entrecôte à la minute (Meschini).

This dish is especially valuable in the treatment of atonic conditions of the stomach, presenting as it does meat in probably its most digestible and appetizing form.

Cut one or two slices from the upper cut of a sirloin of beef, each slice being the entire length of the joint and about a little more than a quarter of an inch in thickness, and beat them well. Take a plate and in it place some olive oil and mix it well with a little salt. Now take each slice of meat by the end with the right hand and draw it through the oil whilst it is being kept under the surface with the left. Now treat the other side in the same manner. Lay the slice of meat on the table and pepper it well on each side with freshly ground pepper from a pepper mill. Throw at once on to a grill which must be already hot. Turn at once upon the other side, take off the grill, and serve in a hot plate which must be in readiness. As a matter of fact, the actual time required for cooking each side will be about five seconds if the fire is right and the grill is hot as it should be. If without undue haste you turn the slice as soon as you realize that the cooking has commenced you will be about right.

Fillet spéciale à la Parisienne.

Take the under cut of a sirloin of beef and from it cut a slice two inches in thickness. Beat this well and treat with salted oil and pepper in the same manner as the entrecôte à

la minute. Grill in the same manner as an ordinary steak and serve on a thick slice of toast surrounded with strawed potatoes.

The most suitable meat dishes for the dyspeptic are—

Mutton.—Leg or shoulder plainly roast or boiled. Slices from a leg of mutton grilled. Mutton chops grilled or cooked in a Gourmet pot. Mutton or lamb cutlets grilled or fried in egg and bread-crumbs, the outside being rejected, or stewed in a Gourmet pot.

Beef.—Slices from the under cut of an underdone sirloin or rib of beef. Steak grilled, Vienna steak, the under cut of a raw sirloin cut off and grilled (*vide* Fillet spéciale, Entrecôte à la minute).

As a rule all immature meat should be avoided, as also pork and veal.

Poultry and game.—Chicken roast, boiled, steamed, grilled, or cooked in a Gourmet pot or casserole. Pigeon roast, boiled, or cooked in like manner. Any game which is not high. Avoid high game, duck, goose, turkey.

THE PREPARATION OF FISH AND EGGS.

The digestibility of fish depends very much upon the care which is taken in its preparation.

Among the methods of cooking fish we may mention steaming, boiling, baking, cooking in a bain-marie or its equivalent as the most appropriate for the use of sufferers from stomach affections.

Steaming.

From an economic point of view this is a far better method of cooking fish than boiling, as in the latter process four per cent. of the weight of the fish is lost passing into the water. The steamer in its simplest form consists of a

saucepan half full of water. Instead of a lid, a metal vessel is fitted, the bottom of which is perforated with holes. The fish or other article being placed upon this, a lid tightly applied, and the whole placed upon the fire, the steam rises through the holes and cooks the food. The advantages of this method of cooking are—

1. Loss of nutrient material into surrounding water, as in boiling, is avoided.

2. It is almost impossible to overcook the food.

3. The resulting product is usually more tender than when cooked in any other way with which we are acquainted.

Boiling.

There are one or two points which must be observed if our dish is to be a success. In the first place there are two distinct methods of procedure, and we must exercise an intelligent choice. The first method is to immerse the fish in absolutely boiling water which contains a small quantity of salt. The second one is to place the fish in cold water containing a little salt and vinegar and slowly raise the temperature. The former method prevents wasting the nutritive part of the fish, but in the second the flavour is better preserved, for which reason we may often, with advantage, make use of it when cooking for dyspeptics. With either method we must carefully watch the completion of the process, as a few minutes more or less will spoil the fish. As a rule the cook will try it with a skewer from time to time to see when it is done. For the last five minutes the fish should cook in the steam, for this purpose the strainer upon which the fish lies being raised to the top of the pot and placed cross-ways to keep it in position, the fish being closely covered with the lid. In this case it is important to see that the strainer is a wire bottom and not a perforated plate.

Cooking by means of a Gourmet pot.

One of the best ways of cooking fish is by means of the Gourmet pot. The following are suitable recipes:—

Method 1.

Take a whiting, skin and fillet, and well dry the pieces. Cut them into suitable lengths to go in the Gourmet. Take a Gourmet, size No. 6 or 7, and well butter the bottom. Place therein the pieces of fish and add a few drops of lemon juice. Stand the Gourmet in a saucepan half full of boiling water and cook for twenty minutes.

Method 2.

Place your fish prepared as in the last recipe in the Gourmet and cover with good white or brown stock. Cook until done, drain, arrange upon a hot dish, pouring over a little of the same stock, which has been reduced to one-half by boiling. This of course must be prepared at the same time that the fish is cooking in order that it may be ready as soon as it is done.

Fish stewed in fish stock. (Souché.)

In this method any white fish such as flounders or soles are stewed in stock which may be either white, brown, or made from fish, together with a little dried julienne of vegetables.

Roasting.

A method of preparing fish by roasting is warmly advocated by Sir Henry Thompson, from whose book I quote the following:—[1]

"The method consists in placing the fish after the usual cleaning entire if of moderate size in a block-tin, nickel, or

[1] *Food and Feeding*, p 194 1901

aluminium dish adapted to the size and form of the fish and a little deeper than the thickness of it, so as to retain all the juices which by exposure to the heat will flow out. First, however, the surface of the fish is to be lightly spread with butter and a morsel or two added round it; the whole is then to be placed in a Dutch or American oven in front of a clear fire. . . . It is necessary to guard against over-roasting so as to dry the fish and evaporate the gravy. . . . Portions of fish prepared as fillets may be treated as well as the entire fish." In cases where the clear fire is not available baking in the oven will produce results nearly as good.

Scalloped oysters.

Blanch two dozen oysters in their own liquor. Place them in a plate and pour the liquor into a basin. Take four scallop shells, grease well with butter, and sprinkle a teaspoonful of bread-crumbs into each. Now arrange six oysters in each shell, cover with bread-crumbs, and add a few small pieces of butter. Sprinkle with pepper and salt, pour in the liquor, fill the shells with bread-crumbs, and put a little piece of butter on the top of each. Bake in a brisk oven for fifteen minutes.

Stewed oysters.

Blanch twelve oysters and cut each of them in two. Mix together an ounce of butter, a gill of milk or of the liquor from the oysters if obtainable, half an ounce of flour, and place in a saucepan. Bring to the boil and add a small blade of mace and half a gill of cream or milk. Now simmer for ten minutes, remove from the fire, and stir in the yolk of an egg, a teaspoonful of lemon juice, and the oysters. Heat to 180° Fahr. for a minute, carefully avoiding boiling, and serve.

Poached eggs in milk.

Fill a small saucepan three-parts full of milk, add a pinch of salt. When boiling slip into it two eggs which have been broken in a saucer. Boil gently until done. Place two pieces of hot buttered toast on a plate, pour some of the hot milk over. Place on these the eggs and serve.

Scrambled eggs.

Beat up a couple of eggs, two tablespoonfuls of milk, and a pinch of salt. Now melt an ounce of butter in a saucepan. When melted, commence to pour into it the beaten-up eggs, stirring all the time. Serve on buttered toast.

Coddled eggs.

This is a method of cooking eggs which as a rule turns out a very satisfactory product. Place a new-laid egg in a cup, fill it up with boiling water, and stand on the hob for six or seven minutes. It is then done.

Buttered eggs.

Beat up an egg with a teaspoonful of Bovril. Melt half an ounce of butter in a frying-pan. Pour in the egg and continue to stir until it has commenced to set. Serve on buttered toast.

Savoury custard.

Whisk together an egg, a gill of beef tea, and a quarter of a saltspoonful of salt. Pour this into a small gallipot which has been well buttered inside and tie down with buttered paper. Stand in a saucepan half full of water and simmer for fifteen minutes. Turn out into a hot dish and serve.

The selection of fish for a dyspeptic.

The coarser kinds of fish and those containing much oil are to be avoided. We are therefore practically limited to sole, plaice, whiting, fresh haddock, smelts, trout, and turbot.

The fish may be boiled, steamed, grilled or roasted, or baked. Frying is unobjectionable only if, after having been well covered with egg and bread-crumbs or thin batter, the fish is plunged beneath the surface of sufficient boiling fat or oil to cover it. In this case the outer brown part can be rejected, and only the white inside eaten, which is untouched by the fat.

THE PREPARATION OF VEGETABLES.

Green vegetables are especially important as articles of diet, both from the vegetable salts which they contain and also from the cellulose of which they are partly composed. It is therefore important not to deny the patient the use of these unless absolutely obliged, for as a rule green vegetables are easily digested if properly prepared. In England alone of all the civilized countries of the world the middle-class cook is ignorant of other methods of preparing green vegetables for use as food except boiling in plain water, roughly draining, and sending up to table, sometimes by themselves, and sometimes with a mixture of flour and milk she calls white sauce. Another common error in this country is to eat the green vegetables with the meat. For two reasons this is wrong. In the first place a green vegetable properly cooked is worthy of forming a course by itself, and secondly if served by itself it will be better masticated and insalivated and consequently digested. As regards the green vegetables which may be used by the dyspeptic, the two most important, namely, lettuce and endive, are hardly known in this country as a cooked vegetable except in

restaurants and private families employing a French chef, their use being restricted to salads.

These together with spinach are the most easily digested green vegetables for the dyspeptic. They may be prepared—

(*a*) By stewing in a weak veal or beef stock.

(*b*) By partially cooking in butter and then stewing in stock as above.

(*c*) By braising.

Cooked in any of these ways they may be simply drained and sent up to table, or passed through a sieve and made into a purée.

Of the vegetables which are cooked in plain water, asparagus when properly done is especially digestible, as the tops, which alone should be eaten, will readily disintegrate.

Green peas and French beans should only be taken when very young, and should be invariably passed through a sieve and made into a purée.

In the dieting of dyspeptics we may with advantage make use of rice, tapioca, and the several forms of macaroni as a substitute for vegetables to be eaten with the meat. For this purpose they should be stewed in stock, drained, and dished up with a little of the stock in which they have been cooked, reduced to one-third and poured over as gravy. By this method of treatment what would otherwise be rather insipid becomes converted into an appetizing dish. It is important to bear in mind that an additional flavour may be imparted to any vegetable stewed in stock by placing in the pot either a little piece of bacon or half a small sausage.

Plain-boiled green vegetables.

The cooking of green vegetables in plain water simply requires the observance of a few simple rules. First of all they must be thoroughly clean. The mistake is often made of soaking the vegetables in water to which salt has been

added. This should not be done, as the salt, as we all know, will kill the insects, which will be unable to escape and thus remain in the vegetables. The proper method to clean vegetables is as follows. First of all to place them in several waters in succession with the chill off until all sand or earth and insects are removed. Then see that the pot in which they are to be cooked is perfectly clean, as if not the colour will be spoiled and the smell of the cooking will be offensive. Now place in the pot water slightly salted in the proportion of one ounce to two quarts. Bring it up to the boil, and when it boils throw in the vegetables, pressing them well down, and allow them to cook for three or four minutes. Now strain them and place in a second saucepan of boiling slightly salted water. When they have been placed in this second saucepan, cover with its lid until on the point of boiling, remove the lid and skim, and now keep the saucepan uncovered until done. Cooked in this manner no soda will be required to preserve the colour of the vegetables, and they will be soft and as digestible as green vegetables are capable of being.

The usual English method of serving green vegetables simply boiled in water and often imperfectly drained may often with advantage be departed from in ordering the diet of dyspeptics. By increasing the flavour we can render vegetables much more appetizing and, as modern experiments have proved, more digestible in consequence. The following are examples of vegetables cooked in this manner:—

Lettuces with gravy (Gouffé).

Take four large cabbage-lettuces, trim off the outside leaves, wash and blanch for several minutes, drain, cut in two, sprinkle a little salt over them, and tie the halves together with string. Now place in a saucepan large enough with enough stock to cover them. Add an onion with a clove stuck in it, a bouquet of herbs, and a gill of stock-pot

fat. Simmer for two hours. Now drain, untie, arrange on a dish with sippets of toast, and pour over a pint of stock which has been reduced to one-half by boiling.

Stewed celery.

Take one or two heads of celery, cut off the outside tough sticks, and cut into pieces two or three inches in length. Wash well and blanch them in slightly salted water for a quarter of an hour. Dip into cold water and drain, and then place in a stewpan with enough stock to cover them. Cover with a piece of buttered paper. Cook until tender, drain, and place them on a hot dish. Pour over them some good stock reduced to one-half by boiling.

Purée of lettuce or endive

Take the lettuce or endive, blanch it, put it in cold water, and then drain. Chop it in small pieces and place in a stewpan with as much veal broth as will cover it and a slice of bacon or ham. Let it simmer over a slack fire until it gets quite thick. Pass it through a sieve. Return to the stewpan and heat it. Serve.

Spinach cooked in its own juice.

The ordinary method of cooking spinach by boiling in water is distinctly bad, as not only is the flavour destroyed, but it is rendered very indigestible. The proper method is as follows. Wash and pick three or four pounds of spinach, removing all stalks and grit. Drain carefully and put into a saucepan with a teaspoonful of salt, but no water. Put on the lid and place over a moderate fire. Shake continually and take off the lid from time to time and stir with a wooden spoon to prevent burning. When it is quite tender drain and pass through a sieve. It may now be served as it is, or with the addition of a little butter.

Spinach shapes.

After spinach has been cooked in the aforesaid manner and has been well drained, put it into a saucepan with either a couple of tablespoonfuls of good gravy or the same quantity of butter or cream. Stir it continually over a gentle fire until nearly all the moisture has left the spinach and it is commencing to become dry. Now whilst quite hot rapidly fill a few egg-cups with the vegetable, pressing it down well. Put into the oven for a minute to warm, and turn out and serve on pieces of buttered toast.

Mashed potatoes.

These are a very useful article of diet and may more often than not be taken by the dyspeptic with impunity if properly cooked and eaten in moderation. It is especially important not to deprive a patient of potatoes unless absolutely necessary, as many persons cannot enjoy their dinner without them. Potatoes, moreover, contain valuable salts, and our cooking should be so contrived as to retain as large a quantity of them as possible. Undoubtedly the best way of cooking a potato is to boil or roast it in its jacket, then to reduce it to a fine pulp by passing it through a sieve with a little butter or milk. It may then be served as it is, or added to stock to form a purée **(potato purée)** or thickened soup, or placed in shallow tin dishes and browned in the oven **(brown mashed)**. This last method produces a very digestible dish, and was one of the several specialities for which the "Old Cheshire Cheese" was celebrated.

A very appetizing dish may be prepared in the following manner, the recipe being attributed to the late Dr. King Chambers, who called it

Potato surprise.

Take a large potato and cut off the top as you would the top of an egg, but leaving it attached by the peel of one side

so that it will act as a kind of lid. Scoop out the centre of the inside. Take the raw lean of a nice mutton chop, cut it up fine, season with pepper and salt, put it into the potato, and fasten down the lid with a pin. Now place in the oven and bake. When it is done unfasten the lid, put in a spoonful of gravy, and serve.

Salad.

In many cases these may be included in the dietary of the patient if made in a rational manner. Until the last few years even among the wealthy one very rarely found a decent salad, and an otherwise perfect dinner was marred by a so-called salad which consisted of a mixture of incongruous materials, green stuff, perhaps mustard and cress, radishes, beetroot, watercress, and lettuces soaked in water until they had become sodden, imperfectly drained, some ounces of water occupying the bottom of the salad bowl. Over this was poured a dressing consisting perhaps of yolk of hard-boiled eggs, cream, vinegar, sugar, mustard, and other ingredients according to the ideas of the compounder. Moreover the salad was invariably cut up fine with a steel knife, a procedure certainly not calculated to improve its flavour. Fortunately, owing to the multiplication of first-class restaurants and the ever-increasing number of people who frequent them, the public are gradually being educated to know what a salad should be like. But even at the present day much missionary work remains to be done, as even if you send your cook to a first-class restaurant and instruct her to eat a salad at your expense in order that she may see what it should be like, when she returns she will be quite unable to duplicate the result. As a matter of fact the art and mystery of making a first-class salad is extremely simple and depends upon the observance of certain rules which I shall proceed to enunciate.

1. The selection of the material. As in other arts, the

unities must be preserved and we must take care that the ingredients are compatible with each other. Any of the edible green stuffs may be made into a salad, but radishes and watercress should never be introduced, as they will entirely destroy the flavour. Lettuce, endive, escarolle, corn, dandelion, mustard and cress are the principal constituents of which salad are made, and may be used separately or in a combination of not more than two with the exception of mustard and cress, which should always be taken by itself. For the dyspeptic, radishes, beetroot, and watercress should be avoided.

2. The salad should be well washed but not allowed to soak. In fact it should be washed immediately before it is made.

3. It should be thoroughly dried. This may be done by centrifugal force, swinging the salad in a wire basket or serviette, or by wiping each leaf separately.

4. It should either be torn up with the fingers or cut with a silver knife.

5. Only sufficient dressing should be used to form a thin coating over the surface of the leaves. As the main object of the oil is to prevent the vinegar from soaking into the leaves of which the salad is composed it may with advantage in many cases be applied first, and consequently we have the very simplest form of dressing made as follows :—

(*a*) The well-dried leaves having been placed in the salad bowl, a little of the best olive oil obtainable is added by itself, well mixing between each spoonful. As soon as any drips to the bottom of the bowl enough has been added. A dash of vinegar or lemon juice is all that it now required to make a salad which can be taken and enjoyed by many dyspeptics. It is important that the very best oil should be employed, and this should be procured from a firm of repute.

(*b*) The ordinary French dressing is made by mixing in a

cup a little mustard, pepper, and salt, with one tablespoonful of vinegar and adding to it three of oil. This is then poured over the salad in such quantity that whilst covering the surface of the leaves none shall collect at the bottom of the bowl.

There is no harm in sprinkling a little chopped chervil or tarragon over the salad to improve the flavour. If a suspicion of onion is desired the best way of introducing the flavour is to rub a slice of onion well into a crust of bread and allow it to remain in the salad whilst the mixing process is going on, after which it can be removed.

SWEETS.

The sweet dishes which the dyspeptic may be allowed are not numerous, and even with these there are certain points which must be observed if they are to be taken with impunity.

Milk puddings.

These may often be allowed, but should be made without eggs. The average cook usually errs in putting too much rice, tapioca, or other ingredient into the pudding. The rule should be to sift sufficient rice over the bottom of the dish to cover it. When every part is hidden there is enough. In other words, the bottom of the pie-dish should not be covered more than to the extent of a quarter of an inch in depth. Then the milk is added, and it vastly improves the quality of the product to grate some raw suet on the top. This during the process of cooking will partly become incorporated with the pudding and partly form a skin on the top.

Baked custard pudding.

Put two new-laid eggs in a pie dish and beat them up thoroughly (on this depends the success of the pudding). Put a pint of milk into a saucepan and bring to the boil.

Pour this on to the eggs, stirring all the time. At this stage add any flavouring which is desired, such as a squeeze of lemon or a little vanilla. Place in a slow oven until set. It is most important for the success of the custard that the heat should be kept low and that it should not be even allowed to simmer. A single bubble appearing on the surface will show that the custard has been spoiled. Of all milk puddings it is the baked custard most especially that should not be exposed to too great heat in the oven. In fact it should never be allowed to boil. If a custard pudding is allowed to boil a separation will take place of the whey from the milk, and instead of remaining firm it will become watery. If the cook is so clumsy that she is unable to prevent this from happening, we can render the pudding "fool proof" by placing the baking-dish containing it in another in which is enough water to come about half-way up the side. If this is done the pudding can come to no harm, however much she may neglect it.

Baked apples.

These can be taken by most dyspeptics in moderation. The important point to bear in mind is that since, as we have seen, raw cane-sugar is a powerful irritant to the stomach whilst the process of cooking converts it partly into dextrose which is not so irritating, we may with advantage scoop out the core of the apple and fill it with sugar before we bake it.

Apple fool.

This is another very good way of preparing the fruit, and is chiefly useful in those cases of motor insufficiency of the stomach in which it is imperative to order a diet in a finely divided condition.

Take two pounds of apples, core them, and cut them into quarters. Put into an enamelled iron saucepan with just enough water to cover them, but no more. Stew them well.

When quite done take off the fire and add a sufficiency of brown sugar. Allow the sugar to melt well into them, take off the fire, and pass through a sieve. This is the apple fool in its simple form. To make it more palatable we may flavour it in various manners.

(*a*) We may stew a clove or two with the apples.

(*b*) We may add a few drops of essence of vanilla or a sift of the powder.

(*c*) We may add the juice of a lemon and a bit of sugar which has been well rubbed on the rind.

(*d*) We may stew a quince with the apples.

Having flavoured the apple fool and passed it through a sieve, we add cream or milk or both to bring it to the required consistency. As an alternative method, we may in the first instance stew the apples with milk instead of water.

Jellies

These may often be given with impunity, but should never be made with commercial gelatin but always from calves' feet. Commercial gelatin, except of the best quality, should never be used in the preparation of food, manufactured as it is from any bones, skins, or hoofs of any kind of animal that has died any kind of death.

The jelly should be flavoured with lemon or orange juice, vanilla, the juice of grapes, or with wine. Commercial flavouring essences should be avoided, as they are in many cases composed of chemical irritants.

Junket.

This is one of the best sweets for dyspeptics, consisting as it does of partially digested milk.

To one pint of new milk at a temperature of about 98° Fahr. add one teaspoonful in winter, or one and a half teaspoonful in summer, of essence of rennet. Stir it round

once with a spoon to mix it well, and put aside in a cool place to set. As a rule it will set in an hour. Serve in a glass dish and eat with cream and sugar.

Stewed prunes.

For stewing purposes one must discard the ordinary prunes at fivepence or sixpence a pound and use only the best French plums in bottle, running thirty or forty-eight to the pound. The common prunes will be found gritty and unsatisfactory and quite unsuitable for use by dyspeptics.

Place as many of these plums as will cover the bottom of the saucepan used, lying flat in one layer. Add enough water to just cover them and not more, and three or four teaspoonfuls of Demerara sugar to every dozen and a half. Now add a squeeze of lemon. Bring to the boil quickly, draw to the side of the fire and simmer gently for ten minutes, not stirring at all, but by inclining the saucepan from side to side allowing the liquor to run over the plums as they are cooking. Put to cool.

Instead of water the same quantity of red wine may be used. In this case rather less sugar is used.

Compote of mixed fruits.

This dish is especially useful in the systematic treatment of constipation. Take two parts of apples, and one part each of French plums, figs, and dried apricots. Place in a Gourmet pot with enough water to just cover them and Demerara sugar to taste, and stew for an hour.

APPROXIMATE VALUES IN CALORIES PER 100 GRAMMES OF SOME OF THE COMMONER ARTICLES OF DIET.

A calory may be defined as the total amount of heat which a substance is capable of producing on complete

combustion, and in the case of food may be taken as a theoretical measure of energy. A healthy man weighing about eleven stones will require from 3,000 to 3,500 calories each day in order to preserve his metabolic equilibrium.

Asparagus 16. Tomatoes 17 5. Lettuce 20. Prunes 30. Strawberries 32. Oranges 33. Spinach 34. Apples 35. Cabbage 35. Onions 50. Carrots 57. Milk 70 to 80 according to richness in cream. Veal 75. Raw potatoes 83. Raisins 95 5. Lean beef 100. Sweetbread 115. Chicken 115. Ham 120. Porridge 127. Potato purée made with butter about 127. Eggs 159. One egg about 80. Spinach 165 Ordinary plum cake 187. Purée of white beans 193. Golden syrup 205. Cheese from 240 to 255 according to kind. White bread made of firsts flour 278. Omelets 288. Pancakes 288. White bread of seconds flour 303. Macaroni 312 5. Beef with medium fat 324. Very fat beef 327. Peas 331. Beans 350. Rice 351. Fat ham 360. Maize 371. Chocolate 380. Sugar 400. Very fat mutton 403. Tapioca 404. Oatmeal 412. Fat pork 412. Sausage 431. Fat goose 491. Suet pudding 704. Lard 491. Butter 860.

APPROXIMATE TIME IN WHICH DIFFERENT ARTICLES OF DIET SHOULD LEAVE THE NORMAL STOMACH.

In two to three hours.

Milk, raw eggs, beef tea, clear soups, thickened soups, purées.

In three to four hours.

Roast, boiled, or grilled tender meat such as mutton, beef, ham, veal. Boiled rice, boiled potatoes, boiled green vegetables. Milk puddings, junket. Baked apples. Camembert, Port Salut, Stilton, Roquefort, and Cheddar cheeses. Boiled or poached eggs.

In four to five hours.

Roast or baked meat which has been too much done. Tough steaks or chops. Stews and made dishes and twice-cooked meats. Kidneys, lobsters, crabs, smoked meat or fish such as haddocks and kippers. Lentil porridge, pease pudding. Salads and celery. Radishes. Dutch and other skim cheeses, such as Gruyère.

INDEX OF BOOK

INDEX TO APPENDIX